USER'S EXPERIENCE ON SPACE ASSESSMENT: EMERGENCY DEPARTMENT OF REGIONAL HOSPITAL OF SHKODRA

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Approval sheet of the Thesis

This is to certify that we have read this thesis entitled **"User's experience on space assessment: Emergency Department of Regional Hospital of Shkodra"** and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

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The Emergency Department's (ED) role is to receive, stabilize and treat patients (adults and children) who present themselves or otherwise with a wide variety of urgent and non-urgent conditions. This thesis concentrates on investigation and evaluation of the structural relationship between the physical components of the Unit and its users. Considering ED role as the foundation of a healthcare building, this thesis addresses users experience on the areas of current hospitals Emergency Department (Shkodra's Regional Hospital) project in terms of spaces and components that attribute to it. The connection between space and its users is taken in consideration, how puts up with their experience and wellbeing. To explore the contribution of environmental perception to overall satisfaction of the ED users. Methods used to help this thesis were data collections through observations, questionnaires, interviews, video recording and pictures. Patients, visitors and medical staff of Shkodra's Regional Emergency Department, as the main users of the building, contributed on the data collected. There was no limit on age or sex and every category had its own space to represent their thought on the matter. From the data's collected users had different approach to the issue. Space insufficiency contributes to the users unsatisfaction. Staff in precepted an increase of stress from the lack of space they worked on by the overcrowding. The sanitarians felt more stressed at work than every other category and had the most negative answers about the lack of space, making us think that a relation does exist. They consider the space as one of the elements that contributed to their stress at work.

The nurses were significantly more satisfied than the doctors and sanitarian on terms of space. Doctors found difficulties too, even though they had the least number of spaces they used most. Different from the staff, patients associated overcrowding with noises. Noise was a very important factor on patient satisfaction on adding more to their medical condition. 74.4 % of the patients interviewed testified that noise had an effect on their comfort. The decrease of deaths with 42.5% after the remodulation shows us that space must have had a positive impact on patients.

Keywords: *Emergency Department, Spatial Experience, Patient Satisfaction, Building design, Physical Component*

ABSTRAKT

ANALIZË MBI ROLIN QE KA HAPËSIRA NË EXPERIENCËN E PACIENTIT NË DEPARTAMENTIN E URGJENCËS

RAST STUDIMI: DEPARTAMENTI I URGJENCËS NË SPITALIN RAJONAL SHKODER

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Roli i Departamentit të Urgjencës (ED) është të pranojë, stabilizojë dhe trajtojë pacientët (të rriturit dhe fëmijët) që paraqiten vetë ose te shoqeruar me një larmi të gjerë të kushteve urgjente dhe jo urgjente. Kjo tezë përqendrohet në hetimin dhe vlerësimin e marrëdhënies strukturore midis përbërësve fizikë të Njësisë dhe përdoruesve të saj. Duke marrë parasysh rolin e Urgjences si themelin e një ndërtese të kujdesit shëndetësor, kjo tezë adreson përvojën e përdoruesve në Departamentin e Urgjencës (Spitali Rajonal i Shkodrës) për sa i përket hapësirave dhe përbërësve që i atribuohen asaj. Lidhja midis hapësirës dhe përdoruesve të saj eshte marrë në konsideratë, si pervoje personale dhe perceptim. Të eksplorojë kontributin e perceptimit mjedisor në kënaqësinë e përgjithshme të përdoruesve të ED. Metodat e përdorura për të ndihmuar këtë tezë ishin mbledhja e të dhënave përmes vëzhgimeve, pyetësorëve, intervistave, regjistrimit të videos dhe fotove. Pacientët, vizitorët dhe personeli mjekësor i Departamentit Rajonal të Urgjencës në Shkodër, si përdoruesit kryesorë të ndërtesës, kontribuan në të dhënat e mbledhura. Nuk kishte asnjë kufizim në moshë ose gjini dhe çdo kategori kishte hapësirën e vet për të përfaqësuar mendimin e tyre mbi këtë çështje. Nga të dhënat e mbledhura, përdoruesit kishin qasje të ndryshme ndaj hapësirës. Pamjaftueshmëria e hapësirës kontribuoi në pakënaqësinë e tyre. Sanitarët ndiheshin më të stresuar në punë se çdo kategori tjetër dhe kishin përgjigjet më negative për mungesën e hapësirës, duke na bërë të mendojmë se një

lidhje ekziston. Ata e konsideronin hapësirën si një nga elementët që kontribuan në stresin e tyre në punë. Infermierët ishin më të kënaqur sesa mjekët dhe sanitarët për sa i përket hapësirës. Mjekët gjithashtu gjetën vështirësi, edhe pse kishin numrin më të vogël të hapësirave që përdornin më shumë. Ndryshe nga stafi, pacientët kishin tjeter qasje. Zhurma ishte një faktor shumë i rëndësishëm për kënaqësinë e tyre duke perkeqesuar më shumë gjendjen e tyre mjekësore. 74.4% e pacientëve të intervistuar dëshmuan se zhurma kishte një efekt në komoditetin e tyre. Ulja e vdekjeve me 42.5% pas rimodulimit na tregon se duhet të ketë pasur një ndikim pozitiv te pacientët ne termin hapësinor.

Fjalët kyçe: *Departamenti I Urgjencës, Experienca hapësinore, Komponentet fizike, Komforti i pacient*

I dedicate this thesis to all the people that walked by my side on this long, beautiful and hard journey!

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LIST OF ABBREVIATIONS

ED	Emergency Department
ER	Emergency Room
AHIA	Australasian Health Facility Guidelines
WHO	World Health Organization
EMTALA	Emergency Medical Treatment and Active Labor Act
IAEM	Irish Emergency Medical Association
EBD	Evidence Base Design
HBN	Health Building Note
AHIA	Australasian Health Infrastructure Alliance
FGI	The Facility Guideline Institute
DHS	Department Of Health Services
HFBD	Health Facility Development
APHSP	Advanced Practice Healthcare Scholarship Program
QSUT	Qendra Spitalore Universitare E Tiranes
AQTN	Arkivi Qëndror Teknik I Ndërtimit

CHAPTER 1

INTRODUCTION

With the aim to have a better understanding of the Emergency Departments, the way they function and what can be done more in these kinds of buildings. The research focuses in the Regional Hospital of the city of Shkodra, which is located on the North part of Albania. In a hospital beside the frequent users being them doctors and nurses, who can give fruitful feedbacks about the spaces they use every day, the role of the patients, thought shorter length of stay compared with the staff's experience, is significant and provide enough data for amelioration of the designed spaces.

Taking the opinion of both groups of users would give a more complete panorama of Eemrgency Department functionality, problems and design components.

1.1 Problem Statement

Hospital building is a very sensitive topic for the community because it takes care of the most important asset a human has, its health. And being part of this community, the attention is drawn to the way the architectural elements contribute to its functionality. The Emergency Departments (ED) is one of the most important unit of healthcare building that is responsible for managing, processing, handling, treating and stabilizing patients with Varity degrees of urgency and difficulty, arriving at its door. Furthermore, this space must have a positive effect on its users experience in not aggravating their condition.

According to Abdelsamad (2018), inadequate design of EDs is a major cause of crowding, longer stay and higher mortality. The main reason for this insufficiency is the lack of participation of stakeholders in the design process. Considering the purpose of the hospital as the foundation for future healthcare space, this thesis addresses justified focus on the areas in current hospitals' Emergency Department project in terms of spaces. An analysis of the space role on emergency department users' experience.

1.2 Thesis Objective

The main objective is to investigate and evaluate the structural relationship between the space units and the users. The environmental factors deserve a closer look and a special attention regards the relation between the patient's actual state and its continuity. Do physical components relate to the space affect staffs job performance? Is the quality of health care buildings improving or worsening the medical condition of the patient? Do the spaces make patients uncomfortable? These questions are all part of the equation that should be solved to achieve maximum performance in these public buildings. Existing standards and guidelines for healthcare facility design will be reviewed.

1.3 Scope of works

The aim of the study is to dictate the contribution environment gives into the process of wellbeing. Space and the components that attribute to it, should do no harm and aggravate the healing process, instead facilitate it even more. The scope of this thesis is to consider the functional relationship between physical components of the mentioned facility, users' perception and satisfaction levels. The study focuses to the Emergency Department of Shkodra's Regional Hospital. As obtained from the archives of said institutions, the material itself consisted of visual and technical data. The research data collected are based in three continents (Europe, Australia and America).

1.4 Methodology

In order to reach our target goal, research was made to collect the data necessary to distinguish and compare the results from our case study. First there was essential to understand how healthcare buildings work and how they operate to help the sick and needy. This approach aided the understanding of users' performances. To capture the role of space in ED users' experiences as adequately as possible, data were collected at the department itself. The tools used to get into a conclusion were data collection that consisted on surveys, interviews, questionnaire, taking videos and pictures.

Surveys showed us a glimpse of how the users used the spaces, and how space defined their behavior. Tracking their movements showed us the area's most problematic, that interfered with the performance of staff and the improvement of patient's medical condition. The most walked areas (e.g., the entrance and the hall) were video-recorded by monitoring the users' movements during two different times of the day. These recordings were used to support the observation and the interviews when needed.

As for the staff the data were collected by a questionary with 21 questions with rounding about the way they experience the environment as an everyday user.

Considering the purpose of patients using the ED environments, 9 short questions in the form of an interview were asked. The researcher started each interview by asking for permission to relatives too, especially if the patient was underage. The questions allowed participants to bring up the spatial aspects by being steered in a particular direction. All interviews were audio-recorded and conducted in Albanian. Before the interviews, the researcher was helped by the nurses of the emergency department to know the areas and photographed all spaces patients and staff could access. Because of the hospital policies only one day she was allowed to make recordings.

1.5 Organization of the thesis

This thesis is divided in 7 chapters. The organization is done as follows:

In Chapter 1, the problem statement, thesis objective and scope of works is presented. Chapter 2 talks about the history of modern hospital. Chapter 3, consists of the Emergency Department Units and guidelines Chapter 4, general information about the environment effect. In Chapter 5 there is information about our case study. Chapter 6 talks about data collection, results and discussions and Chapter 7 conclusions.

CHAPTER 2

HISTORY OF THE MODERN HOSPITAL

According to Thomas Marfo (2007), hospitals are large buildings with many divisions with various specializations that use procedures such as treatment or rehabilitation. Bartllet (2007) states that the term hospital comes from the latin word hospitalis," which refers to patients and their treatment. The purpose of these places was to heal and shelter tired or sick travelers. History facts indicate that hospitals first appeared in Europe, Greece as "Aesculapius," named after Aesculapius, the Greek god of medicine. In the Christian era hospitals were used for the same purpose, to host sick and tired pilgrims but also for people that couldn't take medical care at home. The condition of these facilities didn't easy the health problem patient already had. Their messiness, crowdies and gloomy climate wasn't hospitable. (Shi, L., and D. Singh ,2001). Religiose institution played an important role for many centuries such as the Hindu Hospitals established in Sri Lanka in the 5th century BC and the Middle Ages European monastery-based hospitals (5^{th} to 15^{th} century). In France the Parisian Hôtel Dieu, a monastic hospital founded in A.D. 660, operates to this day. (Bartlett, 2007)

On the 13th century these buildings kept being only to host the sick and indigenous and at the same time they would control morbidity and poverty. People were basically waiting for their death in these spaces (Tuxhari, 2012). In Europe, since the beginning of the century the 14^{th}, the first structures are known and documented genuine hospitals. (McKee and Healy, 2002). Santa Maria Nuova Hospital in Florence is known as a genuine structure hospital with dedicated spaces for inpatients, which plan had the shape of the Greek cross (Henderson J, 1991). On top of the wings and at the points of intersection their shrines were placed. Hospitals of the second half of the century to 14^{th}, reinforced the typology in words and developed it further (Tuxhari, 2012).

The middle of the 15^{th} century shows their types with inner courtyards, which during the Renaissance period spread widely in Europe. The end of the 17^{th} century (1694) in England and the middle of the century of the 18^{th} (year 1756) in France, the literature recognizes them as periods in which the model of the monumental hospital

was born “with pavilions”. So, by the end of the century 19th, "wards" type hospitals were built in Europe and more after, until after World War II, experimenting with types derived from the "Monoblock" of the '30s. Immediately after World War II in Europe every 20- and 10-years different types and models of hospital structures are created and tested. (McKee and Healy, 2002)

Hospitals have undergone transitions through years and eras, and according to Shi L and Singh (2001) it is difficult to identify the historical period in which hospitals were born as a typology building dedicated to the diagnosis and treatment of diseases.

2.1 History of hospitals in Albania

The first hospital in Albania was built in Shkoder, in Ajasëm in 1831 and was established in the service of the Turkish army. The hospital in question had a capacity of 80 beds located in two wards. In the years 1850-1860 the hospital was also transferred from Ajasma to Rus-Maxhar (Partizani neighborhood). The building where the hospital was located was new, built for this purpose with two floors. On the first floor was an ambulance, pharmacy, directorate and administration, the second room was for the sick, where 200 beds were normally placed, a capacity that increased so much that in the first ten years of the century its capacity reached 300 beds.

The military were treated, although there were also civilians from all three religions. The hospital, according to various documents, was equipped with an operating room, where all kinds of operations were performed. It lasted until 1916, after it was badly damaged by Serbs, the Austro-Hungarians returned it to a warehouse. At the end of the XX century Austria-Hungary set up a hospital, which according to their consul in Shkodra, Ippen, was a hospital, with a doctor and four nurses (nuns), an ambulance served and a school for girls was set up near it. The sick, who were admitted to this hospital, had free services and medicines, and often the staff of this hospital went to the village where they treated and distributed free medicines and other aids, in order to spread the influence of his country among the Albanian people. This is evidenced by the correspondence of the Austrian consul in Shkodra, who reported that: “The Hospital of the Sisters of Mercy in Shkodra was improved and enlarged with the relevant annex buildings, equipped with an ambulance and a new doctor was

appointed, whose very successful activity contributed greatly to the strengthening of our power in the people".

In addition to Shkodra citizens, in the statistics of this hospital we find the names of many patients from different regions of Albania, even from abroad, in 1904 they accounted for 4% of all patients. In 1913 the Italians laid the foundations for the construction of a hospital, but due to the First World War remained unfinished. This building was demolished by the city regulatory plan, while the military hospital continues to stand, adapted for residential homes. (Agim Parruca, 1981)

Referring to AQTN (Central Technical Archives of Construction) (2014) data, in years'40, in major cities, genuine projects hospitals were designed primarily by Italian designers: in Gjirokastra (1940) with architect Pietro Bartolini in Vlora with designer joint stock company "A. Chieregatti - A. Donesana" (1940), in Durrës (1940) and in Shkodër (1943) with architect Carlo Buscaglione.

"Ward" type hospital and the birth of "Monoblock" type in Albania had their period of transition from 1920 to 1945. In 1928, the construction project of the "Zogu I" hospital began, which today is known as the "Mother Teresa" University Hospital Center and the works were completed in 1932. It was rated among the best hospitals in Balkans with a capacity of 200 beds. Constantly, over the years, wards of various disciplines were added and by 1945, the hospital also had the ward antituberculosis and birth control (QSUT, Homepage of University Hospital Center "Mother Teresa", 2016). The initial project (1928) has a typical organization monumental, "with pavilions" located in 2 rows parallel to each other and tied at one end. This arrangement is very similar to that of the Royal Naval, in Greenwich, London, 1694, which tends to be repeated in Albania, about 230 years later. This way of organizing structures comes from European influence. Today it resembles the city hospitals of the 19th century in Europe. QSUT became the only one university hospital in the country that took patients from all of Albania. It is unique in its typology. (Tuxhari, 2012)

Projects for Gjirokastra and Vlora represent hospital complexes of the type "with pavilions". Project for Gjirokastra hospital included 15 pavilions with 1 to 3 floors. The complex also provides 2 buildings for accommodation of doctors. In particular they are distinguished in 4 identical one-story pathology wards, located in

the center of the territory. The building had longitudinal open corridors. (Tuxhari, 2012)

The project for the Durrës hospital (1940) is the first example which makes of hospital that changed the pavilion type, being followed by the project for Shkodra hospital in 1943. They were built of "monoblock" type. This type is characterized by a single volume geometrically shaped buildings as close as possible concentric ones, in which are collected all general hospital services and medical ones.

The project for the hospital of Shkodra (1943) *(Figure 2.1)*, brings for the first and last time the vault of a church inside a hospital. It is placed on the extension of the main entrance axis to the ground floor. On one side of this entrance is located the outpatient area and on the other side the administration and residence (dwelling) of nurses (sisters: suore). The first floor includes the wards of bedding divided by gender. On the second floor is placed the operating block and the ward. (AQTN, 2015)

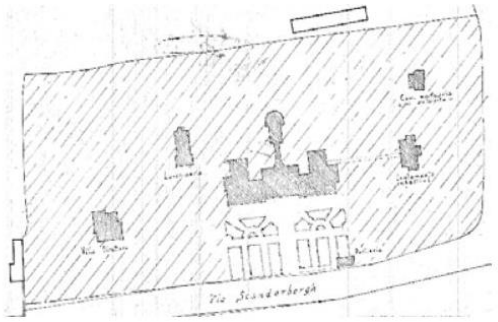


Figure 2.1 General plan of the hospital of Shkodra (1943), AQTN

By the end of the 19th century, hospitals with separate wards were being built in Europe to favor natural lighting and ventilation, while in Albania these types were not built until near the middle of the 20th century (1940). (Tuxhari, 2012)

2.2 Classification of hospitals

World Health Organization (WHO) (2007), stated that hospitals are socio-medical organization whose functions are: curative, preventive, patient services and training of health workers in biosocial research.

They divided the hospital in 3 classifications *Table 2.1*: on the basis of objectives, of ownership, of medicine. According to Mulligan and others (2003) hospitals are divided in the size (how many patients they are able to respond to) and the service they offer. He classifies them in 3 groups: primary level hospital, secondary level hospital and tertiary level hospital. *Table 2. 2*

Table 2. 1 Classification of hospitals (WHO, 2007)

Objective	Ownership	Treatment
Teaching-research Hospitals (Teaching-based, engaged in the propagation of science)	***Government Hospitals*** (Fully owned managed and controlled by the government.)	***Ayurvedic*** (Based on ancient texts that focus on a "natural" and holistic approach to physical and mental health)
General Hospitals (Provision of medical care)	***Semi-Government Hospitals*** (Partly owned by government)	***Homeopathy*** (Known as homeopathic medicine)
Special Hospitals (Provide specialized medical care/ work on a specific organ of the body or a specific disease)	***Voluntary Agencies*** (Run and are in control of voluntary organizations/ may be general hospitals or special hospitals or even teaching institutes)	***Unani*** (Management of any disease depends upon the diagnosis of disease)
	Personal Charity (Owned and operated by private charitable organizations)	***Allopathy*** (Use of pharmacologically active agents or physical interventions to treat or suppress symptoms, diseases or conditions

In the *Table* 2.1 we see the division on bases of objectives. There are three main groups: the Research Hospital that is focused on relying on science for improvement and development, the General Hospital is a hospital in which patients with many different types of ailments are given care, treating all the medical cases, and the Special Hospitals which is focused on specific illness. Another group is based on the ownership. This classification is divided into four; Government which are fully managed by government, Semi Government that get financial help time to time, Voluntary Agencies are in control of voluntary organizations and the Personal Charity managed by private organizations.

Table 2. 2 Classification of hospital, Mulligan at al (2003)

Disease Control Priorities Project: terminology and definitions	Alternative terms commonly found in the literature
Primary-level hospital: few specialties—mainly internal medicine, obstetrics and gynecology, pediatrics, and general surgery, or just general practice; limited laboratory services available for general but not specialized pathological analysis	District hospital Rural hospital Community hospital General hospital
Secondary-level hospital: highly differentiated by function with 5 to 10 clinical specialties; size ranges from 200 to 800 beds; often referred to as a *provincial hospital*	Regional hospital Provincial hospital (or equivalent administrative area such as county) General hospital
Tertiary-level hospital: highly specialized staff and technical equipment—for example, cardiology, intensive care unit, and specialized imaging units; clinical services highly differentiated by function; could have teaching activities; size ranges from 300 to 1,500 beds	National hospital Central hospital Academic or teaching or university hospital

Table 2. 3 Components of regional hospital, Mulligan at al (2003)

Specialist services available on site	Components explicitly included	Specialist services available on site	Components explicitly included
Regional (secondary) hospitals			
Anesthetics	—	Mental health (psychiatry and psychology)	Acute inpatient and outpatient treatment
Diagnostic radiology	X-ray, CT scan, ultrasound, fluoroscopy		Child and adolescent psychiatry
General medicine	Echocardiography, stress electrocardiogram		Electroconvulsive therapy
	Specialist immunology nurse		Liaison psychiatry
	Regional intensive care unit		Satellite clinics
	Diabetes, endocrine clinic	Obstetrics and gynecology	Emergency obstetrics and gynecology
	Gastroenterology, including endoscopy, proctoscopy, sigmoidoscopy, colonoscopy (with general surgery)		Ultrasound, prenatal diagnosis
			Kangaroo mother care
			Basic urogynecology
	Geriatric care	Orthopedic surgery	General orthopedic surgery
	Genetic nurse and counseling		24-hour trauma service, accident and emergency
	Oncology palliation and basic care		
	Neurology basic care	Pediatrics	Neonatal low and high care
	Spirometry and oximetry		General pediatric medicine service
	Basic rheumatology		General pediatric surgery (general surgeon)
General surgery	Regional burns service	Rehabilitation center	Physiotherapy, occupational therapy, orthotics and prosthetics, speech therapy, dietetics, podiatry
	24-hour trauma service, accident and emergency		Acute rehabilitation team

In *Table 2.3* is shown more the regional hospital and the services it offers on treating and curing the patients.

CHAPTER 3

EMERGENCY DEPARTMENT AND ITS FUNCTIONAL AREAS

"The function of the Emergency Unit is to receive, stabilize and manage patients who present with a large variety of urgent and non-urgent conditions whether self or otherwise referred "(Griffin,2015). DHS (2004) also states that Emergency Unit, also known as "Emergency Department" (ED), "Emergency Room" (ER), and "Accident and Emergency Department", provides for receiving and managing disaster patients as a part of their main role. The Emergency Department is intended to be the first point of contact and evaluation for medically ill or wounded patients (IHFG, 2019).

Initial emergency management is care provided to stabilize a victim's condition and to minimize potential for further injury during transport to an appropriate service (FGI, 2001). According to DHS (2004) the Emergency Unit 's role is to accept, treat and handle patients with a wide variety of emergency and non-emergency situations, whether self-referred or otherwise.

As per Heisler in 2014, hospital-based Emergency Departments (EDs) are obliged by the Emergency Medical Treatment and Active Labor Act (EMTALA) to stabilize patients with emergent conditions regardless of income and ability to pay. EDs play an important role in the health-care safety net by assisting the uninsured, underserved, and Medicaid recipients. 24 hours a day, 7 days a week, EDs provide emergency care, urgent care, primary care, and behavioral health care services in communities where these services are unavailable or unavailable for hours. It is advised that hospitals which do not offer emergency care place a visible outside sign at the main entrance showing this and offering emergency treatment to the closest hospital (DHS ,2004). Another key role EDs play is their importance during natural disasters (Heisler,2014).

3.1 Functional areas of the ED

Primary emergency management services are provided to enhance the victim's health and to decrease the danger of further injury during the transfer to the right service. The patient may travel to the nearest hospital, where all the facilities necessary for the final emergency response may or may not be provided. In such cases, it is essential for the hospital to assess, stabilize and arrange for proper transfer to the emergency, sickness and injuries (AIA and FGI, 2006). Where a 24-hour ambulance service is to be provided, the form, scale and number of services shall be as specified in every hospital program of operating (FGI, 2001*).*

There are different categories in which u can define an ED. According to Facility Guidelines Institute (FGI) (2001), DHS (2004), HFB (2019) and AIA (2006) grouping the Unit is categorized by its functional areas. On *Table 3.1* we have the division of each of these studies made. There are similarities on the these grouping like the entrance, reception/triage, waiting area, Observation/acute treatment, Resuscitation and Staff area.

The below shall be entitled as a minimum of area an Emergency Unit must provide:

Table 3. 1 Functional areas by FGI (2001); AHIA (2019); DHS (2004), AIA (2006)

	FGI (2001)	AHIA (2019)	DHS (2004)	AIA (2006)
1	Grade-level well-marked, illuminated, and covered entrance	Entry	Entrance	Entrance
2	Paved emergency access	Ambulance areas	X	Emergency access
3	Reception, triage	Triage and registration	Reception	Reception, triage, and control station
4	Public waiting	Waiting	Public waiting area	Public waiting area
5	Observation and treatment room(s).	Assessment and treatment	Acute Treatment and associated Consultation	Observation/holding units for patients requiring observation

			Rooms / Workstations	up to 23 hours or admission to an inpatient unit should be located separately but near the main emergency department
6	Trauma/cardiac rooms for emergency procedures, including emergency surgery	including resuscitation, fast track, and other specialist zones and rooms	Resuscitation	Trauma/cardiac rooms for emergency procedures, including emergency surgery
7	Decontamination area	X	X	Decontamination area
8	Emergency equipment storage	X	X	Equipment storage
9	Toilet room for patients	X	X	X
10	Administrative center or nurses' station	Staff areas	Staff Amenities Administration	Support areas for staff
11	Radiology	Xray room	Radiology area	Radiology
12	Housekeeping room	X	X	X
13	Storage rooms	Support areas	X	Supply storage
14	X	X	X	Communications center
15	X	X	X	Special patient care areas
16	Paediatric treatment rooms	Paediatric	Paediatric area	Paediatric treatment rooms

Optional Areas by FGI (2001) include:

- *Pediatric Assessment/ Short Stay*
- *Mental Health Assessment Rooms*
- *Short-Stay Unit/ Emergency Medical Unit for extended observation and management of patients*
- *Ambulance Base and facilities.*

In opinion of Australasian Health Infrastructure Alliance (AHIA) (2019) and International Health Facility (IHF) (2017) as shown in *Table 3.2*, the ED will

generally be categorized into the following functional zones, with the scope determined by the size. This category is dependent on how many it can accommodate. The schedule of accommodation offered is based on the indicative size below. Spatial allocations would need to be changed accordingly to satisfy particular project potential requirements:

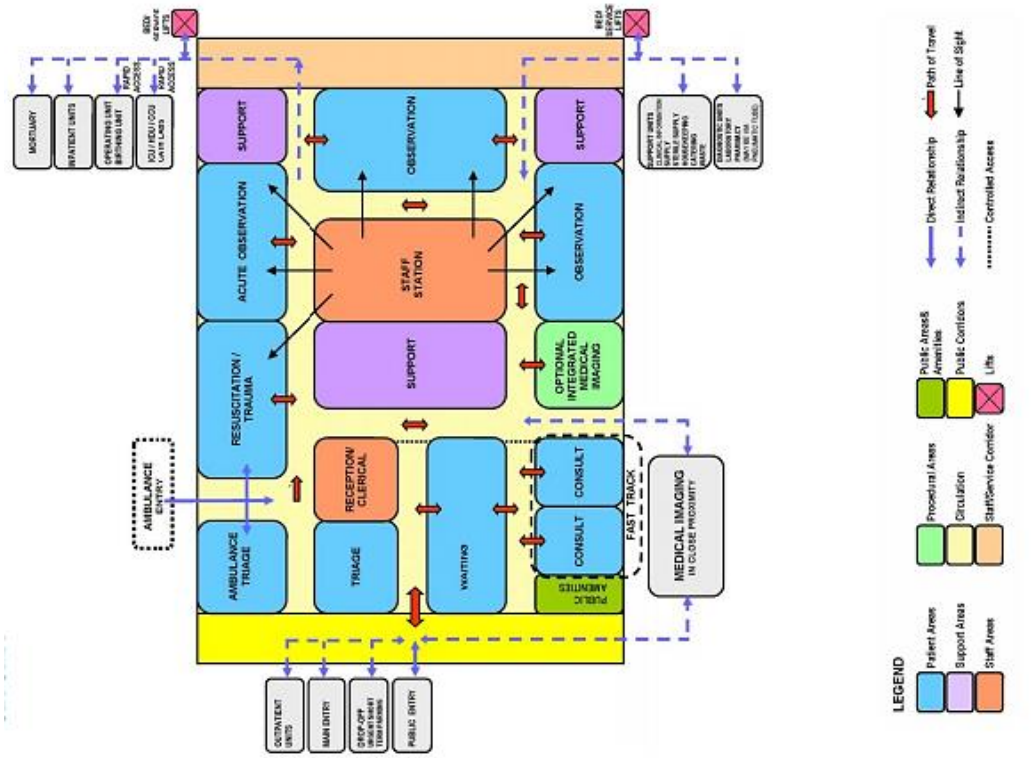
Table 3. 2 Classification of ED by AHIA (2019); IHF (2017)

Definitation	IHF (2017)	AHIA (2019)
Small	5 to 10 treatment spaces (not including Procedure and Treatment Rooms)	5-15
Medium	11 to 30 treatment spaces	16-30
Large	31 to 100 or more treatment spaces	31-60 or more

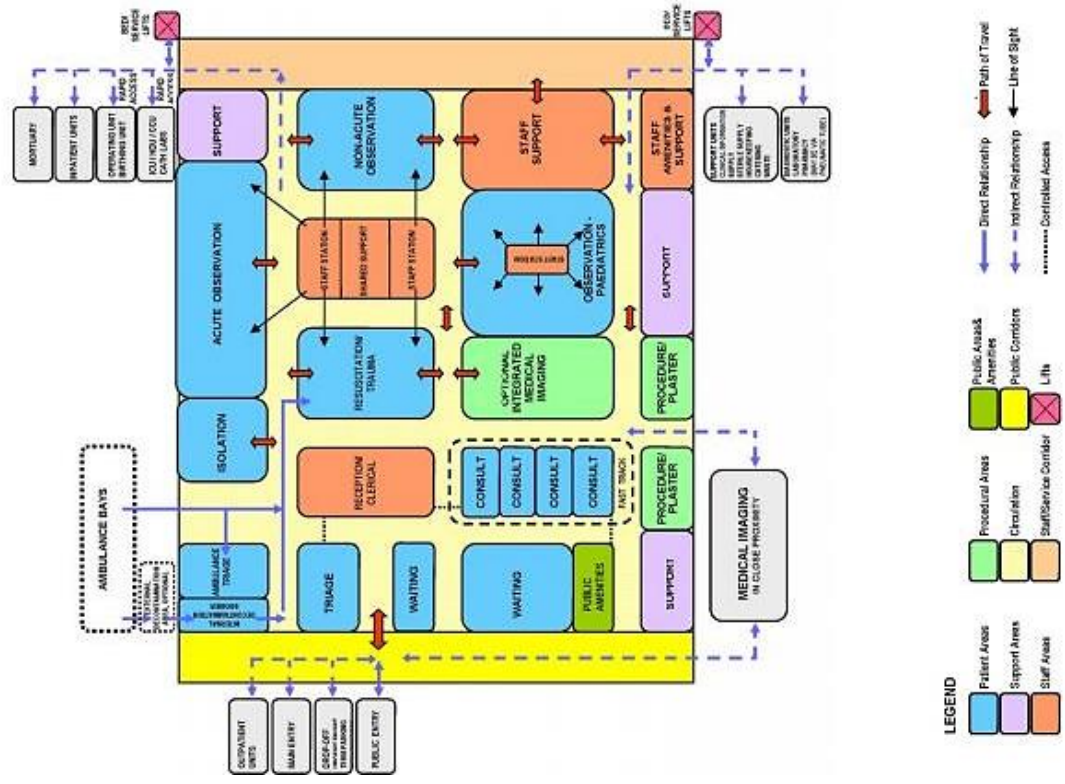
The accommodation layout must be based on the estimated total ED capacity to describe the specifications of the indicated service area comprising entrance/attendance, triage, emergency, clinical support, and personal services. In the division of these areas are not included zones like resuscitation room and the ED short stay unit. These estimates include acute (adults and children) and fast-track sections, as well as resuscitation bays, short-stay bays, specialist bays, and specialized treatment and consult rooms. With the increase of the number of these unit components happens the increase of the total ED capacity. For example, if the treatment spaces are 5-15 then there is need for only 1 Resuscitation room and no short stay unit (SSU), because it is enough to fulfill its treatment requests. If the treatment zones exceed more than 15 till 30 then the need for Resuscitation room ranges from 3 to 5 and for the SSU 6 to 12 spaces.

In *Figure 3.1* are 2 examples of a small, medium and a large ED. In the *Figure 3.1* (C) some areas are added, in comparison to *Figure 3.1* (A, B), like pediatrics observation in the medium ED, adding this way the volume of the space. Some spaces are enlarged some are decreased according to necessity. (IHFG, 2017)

(A)


MORTUARY
INPATIENT UNITS
OPERATING UNIT BIRTHING UNIT
RAPID ACCESS
ICU / HDU / CCU CATH LABS
SUPPORT
ACUTE OBSERVATION
RESUSCITATION / TRAUMA
AMBULANCE ENTRY
AMBULANCE TRIAGE
RECEPTION/ CLERICAL
TRIAGE
STAFF STATION
OBSERVATION
SUPPORT
WAITING
OPTIONAL INTEGRATED MEDICAL IMAGING
CONSULT
FAST TRACK
PUBLIC AMENITIES
MEDICAL IMAGING IN CLOSE PROXIMITY
OUTPATIENT UNITS
MAIN ENTRY
DROP-OFF
PUBLIC ENTRY
LEGEND
Patient Areas
Support Areas
Staff Areas
Procedural Areas
Circulation
Staff/Service Corridor
Public Areas& Amenities
Public Corridors
Lifts
Direct Relationship
Indirect Relationship
Controlled Access
Path of Travel
Line of Sight

(B)


MORTUARY
INPATIENT UNITS
OPERATING UNIT BIRTHING UNIT
RAPID ACCESS
ICU / HDU / CCU CATH LABS
SUPPORT
NON-ACUTE OBSERVATION
STAFF SUPPORT
STAFF AMENITIES & SUPPORT
ACUTE OBSERVATION
STAFF STATION
SHARED SUPPORT
OBSERVATION - PAEDIATRICS
SUPPORT
ISOLATION
RESUSCITATION TRAUMA
OPTIONAL INTEGRATED MEDICAL IMAGING
PROCEDURE/ PLASTER
AMBULANCE BAYS
RECEPTION CLERICAL
CONSULT
FAST TRACK
AMBULANCE TRIAGE
TRIAGE
WAITING
PUBLIC AMENITIES
MEDICAL IMAGING IN CLOSE PROXIMITY
OUTPATIENT UNITS
MAIN ENTRY
DROP-OFF
PUBLIC ENTRY
LEGEND
Patient Areas
Support Areas
Staff Areas
Procedural Areas
Circulation
Staff/Service Corridor
Public Areas& Amenities
Public Corridors
Lifts
Direct Relationship
Indirect Relationship
Controlled Access
Path of Travel
Line of Sight

(C)

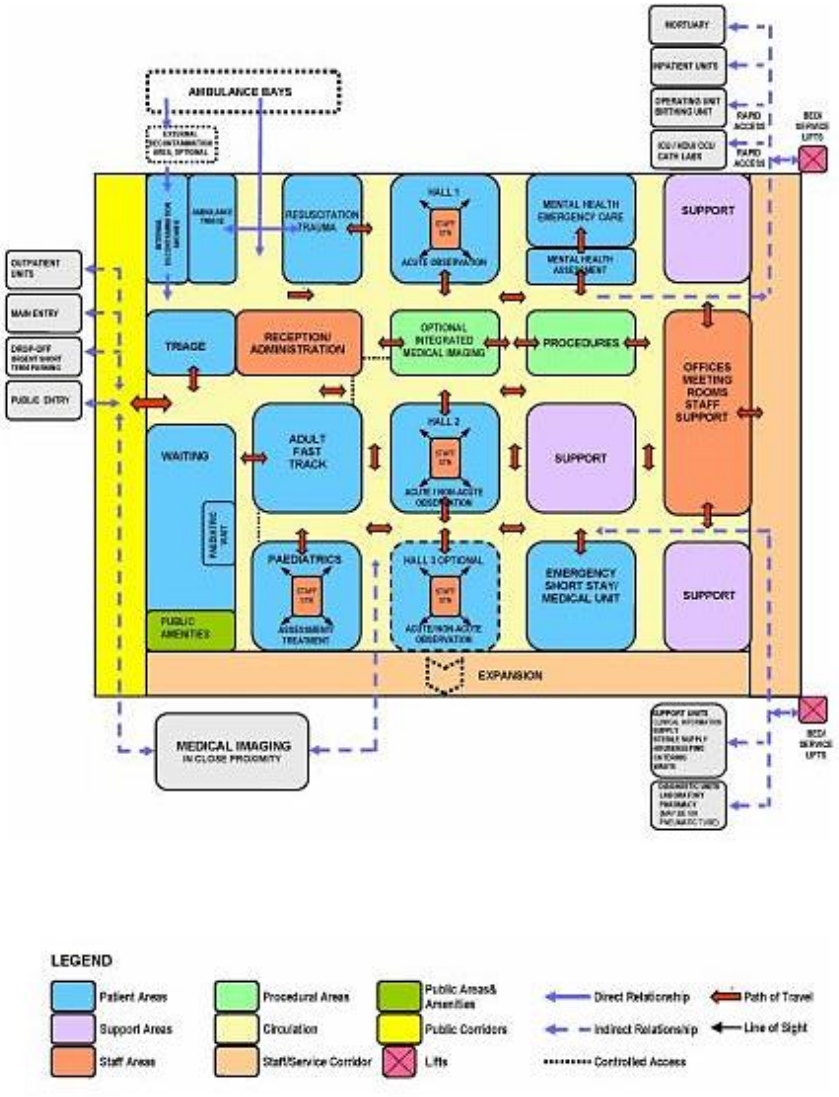


Figure 3. 1 (A) small treatment spaces, (B) medium treatment spaces, large treatment spaces (C), IHFG (2017)

3.1.1 Entrance design

The ED should be accessible to walk-in and ambulance patients according to Irish Emergency Medical Association (IAEM) (2007), FGI (2006) and DHS, (2004). According to Heisler (2014), decisions concerning the site's location have a major impact on the staff of the Emergency Unit's future expenses and organization. For a

smoother transition, it should be located on the first floor. Patients arriving by ambulance will have immediate access to the emergency department (APHSP,1963). In order to allow patients to get out of automobiles and ambulances, the entry to an emergency unit must be clearly marked, lit, and covered. Temporary parking should be provided close to the entrance. In cases when a high structure for ambulance discharge is active, a disability ramp must be provided (DHS, 2004).

To ensure the patient's safety, the walk-in door should be separate from the ambulance's entrance. The Ambulance Entrance should be separated as much as possible from the ambulant patient entrance for sight and sound. Patients arriving by private transportation must still be able to be excluded from the ED entry. Both entrances should direct patients to the Reception/Triage Area. Patients entering the automobile who use a wheelchair for entry to the ED must be near the entrance (IAEM, 2007; Heisler, 2014).

Doors should be a convenient access point to stretchers (APHSP,1963) and should be marked correctly (Heisler,2014). The facility should also offer quick access to resources indicated in the Functional program from respiratory, laboratories, radiology, operations and other key departments. The unit shall be positioned in such a manner that medical emergency resuscitation teams can respond immediately to emergency calls with a minimum of travel time. Storage systems should provide for access possibilities for emergency equipment from other agencies. In order to eliminate traffic, the location needs to be arranged. (FGI, 2006) Waiting rooms for disabled or mobility assistance people should offer wheelchair spaces and accessible chairs. (DHS, 2004).

An important issue the IAEM (2007) addresses is that the medical, nurse or other staff who are not in an ED for a particular patient care industry should not be allowed to access the ED clinical areas. ED entries should never be utilized as public hospital entries or as route-through routes for employees and non-ED patients in hospitals since this adversely affect ED patient care and privacy and end up risking patient and personnel security. In addition, the points of access have to be addressed carefully (Heisler, 2014). To guarantee that all routes of access are clear, safety personnel must be mobilized 24/7. (IAEM, 2007)

Furthermore, the young children's access needs are comparable to those of the disabled. Free car parks must be available alongside the ED and are for disabled persons and for families with children and toddlers (IAEM, 2007).

3.1.2 Reception/ Triage

In the triage and reception area staff does the procedure through which the patient's therapies are prioritized on the basis of their seriousness. (APNSP, 1963) The monitoring of all people entering the ED must be permitted and conceived with adequate regard for staff safety (Australasian Guidelines,2019).

According to FGI (2021) the reception and the triage must be located in a way that allows the staff to observe the main entrance and the waiting public area. The reception area should be designed so that employees may sit at eye level with standing patients or visitors. The lobby space should offer a continuous view over the whole waiting area (IHFG, 2017). According to Heisler (2014), the reception space is intended to keep the following things:

1. *Patient and visitor reception*
2. *Patient registration interviews and access to information*
3. *Collection of clinical records*

Stated by FGI (2021) there is another division in terms of space and service utilities like public wet spaces, public waiting area, access to water and telephone. Two unisex wheelchair-accessible WCs should be installed close to the reception area. They should not be overlooked from the waiting area to provide maximum privacy. (IHFG, 2017).

Staff can supervise and monitor access to treatment areas, pedestrian and ambulance entrances and community waiting areas, the reception and unit should be located (Heisler, 2014). The triage may be near with the reception desk and should have clear a vision to the waiting Room, the ambulant entry and the ambulance entrance.

The Triage nurse may interview patients, perform observations and provide first aid in relative privacy in a bed bay or triage cubicle (IHFG, 2017). The design of this desk should be particularly emphasized to invite patients and visitors, especially youngsters, to approach the base. In order to aid patient confidentiality, additional attention may

be given to creating privacy screens at the reception counter. There should be a welcome desk so that the entry, waiting area and clinical pathways would be clearly visible. As a longer use is intended, the working width is 120 cm. (HBN,2013)

In reception and triage happen the first procedures in which all patients who attend in an ED are categorized according to clinical requirements. The goal of triage systems for the ED system is important for two reasons: first, to maximize the performance and comfort of emergency services by ensuring that patients are seen according to their medical condition (Considine, 2004). It is essential to identify and enter the triage area quickly. Clear cultural indications and direction should be used for indicating where patients report, where triage and reception spaces have been created such that the triage nurse is the first point of contact for visitors (Australian Guidelines, 2019). Upon arriving at the ED all patients meet with a triage nurse who assess the urgency on the basis of their main complaint, history and indications. (Considine ,2004: IHFG,2017).

Table 3.3 Space capacity according to unit size, IHFG (2017)

Unit Size					Small-10 spaces			Medium-15 spaces			Medium-30 spaces			Large-60 spaces			(spaces only, not including procedure rooms)
Entry/ Reception/ Waiting					Urgent Primary Care												
Airlock - Entry	airle-10-i				1	x	10	1	x	10	1	x	10	1	x	10	Optional; May be shared with Main Entry; Ambulance entry may require separate Airlock
Reception	rece-i l				1	x	10	1	x	15	1	x	20	1	x	20	Staff to observe & control access
Waiting	wait-10-i										2	x	10	2	x	20	May be separate Male/ Female/ Family
Waiting - Family	wait-20-i				1	x	20	1	x	25	1	x	25	1	x	25	
Play Area - Paediatric	play-10-i similar				1	x	8	1	x	8	1	x	10	1	x	10	Adjoining Waiting area
Bay - Vending Machines	bvm-3-i bvm-5-i										1	x	3	1	x	5	Optional
Bay - Wheelchair Park	bwc-i similar				1	x	2	1	x	4	1	x	4	1	x	6	Wheelchairs & trolley holding
Parenting Room	par-i										1	x	6	1	x	6	May be shared with Main Entry
Police/ Security Room	secr-10-i similar							1	x	10 *	1	x	12	1	x	12	* Optional
Toilet- Accessible	wcao-i				1	x	6	1	x	6	1	x	6	1	x	6	May also include facilities for baby change
Toilet - Public & Patient	wcpt-i							1	x	4	2	x	4	2	x	4	For waiting patients and support persons
Triage																	
Triage - Nurse	rece-i similar				1	x	5	1	x	5	2	x	5	2	x	5	May include with Reception
Triage Cubicle/s	NS							1	x	10	2	x	10	4	x	10	Includes exam couch and write-up desk
Ambulance Triage	ambtr-i							1	x	10	1	x	12	2	x	12	1, 2 & 4 bays respectively

In terms of space the dimensions vary according to the capacity and the size the unit has. As IHFG (2017), shows in *Table 3.3* m2 of the reception and the triage area and their compound spaces increase accordingly to unit treatment areas.

3.1.3 Public waiting Area

The waiting spaces will be organized to provide some separation (e.g., adults and children) of each category of patients, including the elderly people and those with requirements for transportation (Australian Guideline, 2019) and have enough space

for wheelchairs, prams, walking aids, and patients to be aided (Heisler, 2014). The waiting room should also have a sample place for patients who are waiting. (IHFG, 2017).

A number of facilities including restrooms, drinking water, distributors and mobile charging stations are available for visitors' use (Australian Guideline, 2019).

Assistance services, such as cable television, might also be provided free. The furnishings must not provide an incentive for self-harm or damage to employees. (Heisler, 2014).

The waiting room should have at least 4.4 m² of floor space. The Triage Nurse should be able to detect. To ensure the safety and well-being of patients, the region should be controlled (Heisler, 2014).

For sizing waiting areas, the following allowances, as quoted above from HBD (2013), may be used 1.5 m² per ambulant place (that is, in a general chair), 3 m² per wheelchair place. For briefing purposes, waiting areas may be sized at 1.85–2.25 m² per place. This allows for:

1. *"10% of waiting places to be suitable for people in wheelchairs";*
2. *"a children's play area based on 10% of the number of main waiting places and sized at m² per child (with a minimum space for three children)".*
3. *"If there is a higher percentage of children and or people in wheelchairs, this allowance will need to increase to 2–3 m² per place "*

Table 3. 4 Patient area usage by Irish Accosiation for ED (2007)

Waiting area: 10 places					
Component spaces	**% of users**	**Qty**	**Unit area allowance (m²)**	**Total area (m²)**	**Waiting area allowance (m²)**
Ambulant places	90%	9	1.5	13.5	
Wheelchair places	10%	1	3	3	
Children's play area (no. of children)	10%	3	2	6	
Net allowance				**22.5**	**2.25 per place**
Waiting area: 20 places					
Component spaces	**% of users**	**Qty**	**Unit area allowance (m²)**	**Total area (m²)**	**Waiting area allowance (m²)**
Ambulant places	90%	18	1.5	27	
Wheelchair places	10%	2	3	6	
Children's play area (no. of children)	10%	3	2	6	
Net allowance				**39**	**1.95 per place**

Waiting area: 30 places					
	% of users	Qty	Unit area allowance (m²)	Total area (m²)	Waiting area allowance (m²)
Ambulant places	90%	27	1.5	40.5	
Wheelchair places	10%	3	3	9	
Children's play area (no. of children)	10%	3	2	6	
Net allowance				**55.5**	**1.85 per place**

On *Table 3.4* we can see the m² necessary for the waiting area are with 10, 20, 30 seats according to IAEM (2017).

According to IHFG (2017) the Public Waiting Area there must have access to:

1. *Triage and Reception Areas*
2. *Toilets*
3. *Baby Change Room*
4. *Light refreshment facilities*
5. *Telephone and change machines*
6. *Health literature*

Children also need a separated space to play and are usually placed in a larger waiting room with more space than a partition according to studies of Heisler (2014) and IAEM (2017). This space may be located inside the present main waiting room, although a little further away from the main seating area.

Recognition should be extended to the usage of laminated one-way glass, which allows individuals to look in but prevents youngsters from seeing out. The relatives should easily see from the Triage and Reception areas. Sitting should be relaxing and sufficient (IHFG, 2017). Toilets, baby changing stations, and baby feeding areas should be located near the infant waiting area. (Australian Guideline, 2019; IAMD, 2017). The children's waiting room should be at least 6 m2 per 1000 pediatric visits each year. As a general rule, there should be at least three seats each patient care block. (IEAM, 2017).

3.1.4 Observation/Acute care treatment

The Observation/Acute care treatment should contain adequate facilities for physical examination of the patient, however the inclusion of unnecessary and easily

dislodged equipment should be avoided. It should be immediately adjacent to the interview room. (Heisler, 2014). A minimum floor space is set at 120 square feet (11,15 square feet) in such rooms according to AIA (2006). Each individual patient must have a least of 20 square feet (whether in separate rooms, cubicles, or multi-bed space) of open floor space with a minimum headwall width of 13 feet (3.96 meters) each bed, excluding preliminaries, doorways, toilet facilities, closets, lockers, and armchairs. (FGI, 2006). The Guideline of the Institute of Facilities (2001) has stated that when treatment cubicles are placed in open multi-bed areas and are separated by curtains, each cubicle has at least 80 square feet (7.4 square meters) open floor space and many beds are furnished based on the available space. There are also restrooms available for the patients' use. (ASHPN,1963)

Table 3. 5 Observation treatment area, Australian Guideline (2019)

Room / Space	SC / SC-D	5 bays (Adults + Paeds)		10 Acute Bays (Adults + Paeds)		14 Adult Acute Bays		30 Adult Acute Bays		
		Qty	m2	Qty	m2	Qty	m2	Qty	m2	Remarks
Patient Bay, Emergency - Acute Treatment	Yes	5	12	8	12	10	12	25	12	May be a mix of adult and paediatric bays where a dedicated paediatric zone is not provided.

According to Australian Guideline (2019) shown in *Table 3.5* square meters depend on the number of the treatment areas. The bare minimum square is 12 square meters (Australian Guideline,2019; Heisler,2014). Bed room in an open plan, floor space between the centers of each bed should be at least 2.4 meters, while the sides and foot of each bed need at least 90cm of clear room. Three meters should be the minimum length (IHFG, 2017).

A potentially aggressive patient should be placed way from the corresponding facilities and monitoring equipment. It should have the fewest additional fixtures or hard furnishings to damage uncontrolled patients or staff. It needs to be sufficiently wide to encircle a patient on a standard bed for a control team of five people. For each patient, visual privacy should be guaranteed in multi-bed rooms from casual observation by other patients and visitors. Patient access to the entry, toilet or lavatories should not be limited by the design for privacy (HBD,2001).

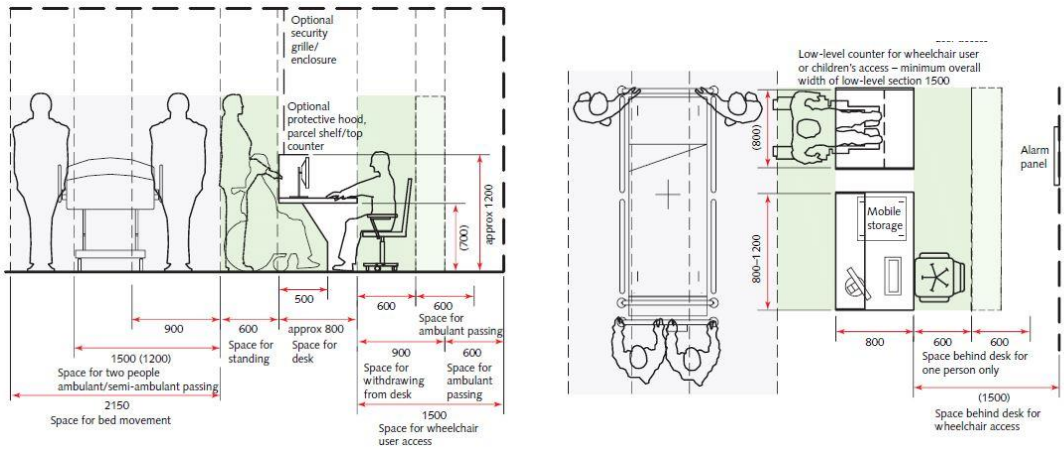


Figure 3. 2 Standards for path spaces and consultation desk, HBD (2007)

The Emergency Unit's corridor width must make it possible without trouble for two hospital beds to pass. The rooms for treatment, procedure and consultation should be suitable for carts to enter and depart. Corridors should not be utilized to store equipment and storage bays should not prevent the access to the corridor. As shown in the *Figure* 3.2, the width of the min pass is 2.1m. (IHFG,2017)

3.1.5 Resuscitation room

The Resuscitation Room/Bay is used for the resuscitation and treatment of critically ill or injured patients. An ED with an average case-mix seeing 20,000 patients per year should have a minimum of two Resuscitation bays with one additional bay per 10,000 patients per year. There should be easy access between the Ambulance Bay and the Resuscitation area. Radiation protection must be incorporated in the design including wall lining and staff and patient protection during portable x-ray. The environment must be climate-controlled environment and there should also be controlled lighting (IAEM,2007). According to Heisler (2014) and AIA (1992-93) the Resuscitation Room/Bay requires:

1. *Fitting space for a customized lifting bed*
2. *360-degree room for continuous operations in all parts of the patient*
3. *Space for circulating personnel and equipment around the working area*
4. *Space for the installation of equipment, monitoring, storage, washing and disposal.*
5. *Suitable illumination and hanging IV fluids equipment*

6. *The room occupiers and others patients and relatives are given maximum auditory and visual privacy*
7. *Facile access to and separation from the ambulance and circulation areas for patients*
8. *Easy access to the Staff Station's Acute Treatment/Observation Area*
9. *Complete variety of equipment for physiological monitoring and recovery Workbenches, storage cupboards, handbasins, X-ray viewing facilities (or digital electronic imaging system) and computer access*
10. *Solid partitions between it and other areas (movable partitions between bed spaces are recommended).*

The emergency resuscitation room, according to Heisler (2014), which includes emergency surgeons, must have at least 250 feet of free floor space (23,23 square meters) and according to AIA, 1992-93) should be at least 240 square feet (21 square meters) in these instances, and access to the room from the ambulance must be at least 4 feet (1.22 meters) wide. According to Australian Guideline (2019) the square meters are dependent on the unit size *Table 3.6.*

Table 3. 6 Resuscitation treatment area, Australian Guideline (2019)

Room / Space	SC / SC-D	1 Treatment bay		1 Resus Bay		3 Resus Bays		5 Resus Bays		
		Qty	m2	Qty	m2	Qty	m2	Qty	m2	Remarks
Patient Bay, Emergency - Resuscitation	Yes			1	25	3	25	4	25	Number of resus bays is indicative and dependent on clinical services planning.
Patient Bay, Emergency - Resuscitation Trauma	Yes							1	30	Larger sized resucitation bay for designated trauma services.
Patient Bay, Emergency - Treatment/Resuscitation		1	16							
Bay - Mobile Equipment	Yes	Shared		1	4	2	4	3	4	Ultrasound, General X-Ray, other mobile equipment.

The minimum of room space is 16 square meters, different from IHFG (2017) study which is 35 square meters (*Table 3.7*)

Table 3. 7 Resuscitation treatment area IHFG (2017)

Resuscitation/ Treatment Areas					8 spaces			12 spaces			20 spaces			40 spaces			
Decontamination Shower	shdec-i				1	x	8	1	x	8	1	x	8	1	x	8	May be external with ambulance bays
Patient Bay - Resuscitation	plbtr-r-i similar				1	x	35	1	x	35	3	x	28	4	x	28	35m2 room has 2 bays, includes handbasin within
Patient Bay - Acute Treatment	plbtr-a-12-i				2	x	12	5	x	12	8	x	12	18	x	12	Qty according to service plan; arranged in clusters of up to 12 beds
Patient Bay - Non Acute Treatment	plbtr-na-i				3	x	10	4	x	10	8	x	10	16	x	10	Qty according to service plan; arranged in clusters of up to 12 beds
Patient Bay - Enclosed, Isolation Negative Pressure	plbtr-h-e-12-i similar													1	x	12	Acute/ Non-acute; includes hand basin within Qty according to service plan
Patient Bay - Enclosed, Isolation - Standard / Positive Pressure	plbtr-h-e-12-i similar				1	x	12	1	x	12	1	x	12	1	x	12	Acute/ Non-acute; includes hand basin within Qty according to service plan

A cubicle curtains may also be used in additional private rooms to accommodate many trauma patients. Provisions for patient monitoring must be provided. Storage for universal precautions apparel must be available for rapid access.

The doors to the cardiac trauma room from the ambulance entry should be at least 5 feet (1.52 meter) wide in order to accommodate stretchers, equipment, and staff. In renovation projects, every effort is needed to ensure that existing cardiac/trauma rooms fulfill the above fundamental standards. If it is not possible to satisfy the aforementioned requirements, the competent authorities may authorize them to diverge from this criterion. The rooms must be clear at least 240 square feet (21 square meters) in these instances, and access to the room from the ambulance must be at least 4 feet (1.22 meters) wide (AIA, 1992-93).

3.1.6 Decontamination area

According to the IHFG (2006), emergency units will need a Decontamination room for patients who have been exposed to toxic chemicals. This section may be connected with the ambulance bay/s or accessed straight from the ambulance bay/s without accessing any other portion of the unit. Shower heads in a portion of the Ambulance Bay ceiling or a specialized internal area with a shower hose spray may be used in the Decontamination area. Heisler (2014) states that other criteria must include:

- *A retractable plastic screen to contain the water flow if located in an external area*
- *A flexible water hose, floor drain and contaminated water trap; all water flowing out of such a decontamination area shall be treated as contaminated water and treated accordingly.*

3.1.7 Radiology

An x-ray unit is the piece of equipment used to generate x-rays. Because of the potential of overexposure to x-rays, the x-ray unit contains both the equipment that collects x-rays and the protected chamber where the x-rays are collected and processed. (APHSP,1963) A general X-ray table, upright X-ray facilities, and an extra overhead gantry in the Resuscitation Area are all recommended for the Medical Imaging Unit. The existence or absence of a film processor is determined by proximity to the main Medical Imaging Department or by the usage of digital radiology. Immediate access to CT scanning, Ultrasound and Nuclear Medicine modalities will enhance the Emergency Unit's effectiveness. A system of electronic display of

imaging is desirable. (Heisler,2014) Workspace design should include sufficient bench-widths or suitable suspension devices for terminals, keyboards, drives and printers. (HFBD,2017)

3.1.8 Pediatric zone

Wherever it is established as a particular area, a bright, welcoming physical environment should be provided, with distressing sights and noises separated from the flow of adult users' activities. The design should encourage parents, away from the normal waiting areas of ED, to stay with children and build a special waiting space with a playgroup. More conventional rooms than an acute adult ED area required for children and closer access to a procedure room (HBD, 2001)

3.1.9 Equipment storage

There must be sufficient room for emergency facilities controlled directly by nursing personnel, including CPR carts, fuel pumps, fan, patient surveillance facilities and the mobile radiography unit. This location is placed in an area that is easily accessible to the personnel, but not in typical traffic patterns to the functional program (AIA, 1992-93).

3.1.10 Staff area

Staff work areas and meeting rooms will generally be collocated in a zone that is accessible only by staff. Staff amenities including change rooms will also be collocated and accessible only by staff. Depending on the size of the ED, some staff toilets may be located near treatment areas so that travel is reduced. Staff work areas associated with coordination of the overall department should be located close to the reception/triage area. (AHIA, 2019)

3.2 Functional program and patient's management

The task of ED is to accept, diagnose, stabilize and treat patients with a wide range of conditions of varying urgency and sophistication (AHIA, 2019). The Emergency Room (ER) is a busy, temporary health care environment that often, due to its existence, involves procedures that would not usually be compromised in other urgent settings, such as the security of privacy and safety of patients. Nonetheless, a

variety of ED-specific variables may have an effect on how patient is managed (Moskop J et al., 2005). Because of overcrowding, length of stay, and lack of caregiver vigilance at times due to access blocks, patients may also be in areas not intended for patient care (e.g., hallways). Due to the focus on ED or ideally short-term care, the environment should be designed to make it easier to handle patient management. (Saba, J. and P. Bardwell, 2004).

A functional relationship can be defined as the correlation between various areas of activity which work together closely to promote the delivery of services that are efficient in terms of management, cost and human resources. A relationship between the external and internal functionality. (AHIA, 2019)

An external connection includes easy access for hospitalization units, medical and surgical admissions, outpatient care units, patient follow up and references, and continuous examination for unaccounted patients. An internal relationship consists on the units' connections according to their functionality. Within the department, key functional relationships include the following:

1. *The design should permit fast access to every traffic-related space.*
2. *Close proximity should exist between the non-ambulant resuscitation and acute treatment areas, and other ambulatory and non-ambulant treatment areas, so as to enable personnel to be transferred at times of heavy workload.*
3. *All places should not be accessed by visitors and patients*
4. *It is necessary to safeguard visual, auditive and sensory privacy, recognizing the necessity of personnel to observe the patients.*

According to IHFG (2017) optimal internal relationships are outlined in the diagrams below include the following:

1. *Triage and waiting located at the Public Entry of the Unit; Ambulance Triage located at the Ambulance Entry*
2. *Direct link from Ambulance Entry, to Ambulance Triage and Resuscitation areas*
3. *Close proximity of Resuscitation and Patient Treatment Areas*

4. *Patient treatment areas divided into Fast Track, Acute/ Non-acute Care/ Observation, with the addition of specialist areas such as Pediatrics, Mental Health and Short Stay Unit in larger Emergency Units*
5. *Staff Station/s located centrally within Treatment Areas, with direct oversight of Resuscitation, Acute Treatment and Non-acute Treatment bays*
6. *Access from all Patient Treatment and Consult areas to the Integrated Medical Imaging facilities*
7. *Support areas for Treatment zones located adjacent to the zones for ready access*
8. *Staff amenities and Administration may be accessed externally from staff/ service corridors and located on the perimeter of the Unit.*

The largest aggregation of nursing staff will be in the Observation /Resuscitation Area. This is meant to be the priority around which some therapeutic regions are grouped together. The entrance/reception area is at the center of initial presentation. The reception, triage and control station shall be situated in such a way as to allow personnel to track and monitor access to patient areas, pedestrian and ambulance entries and public waiting areas (DHS, 2004).

Initial emergency management must be required at each hospital, and full-scale conclusive emergency facilities may be impractical and/or needless duplication. Both facilities need sufficient resources and 24-hour personnel to ensure that critical care is not prevented (FGI, 2001). These factors may include open-plan physical design, crowded and public space, 'fish-bowl' like staff stations, curtains only between most patients, high patient volume and throughput (Saba, J. and P. Bardwell, 2004).

High visibility is built on a philosophy that encourages traffic to flow by, extends the care area where additional equipment is required, and, for short-term personnel – tracks a variety of patients at the same time to identify improvements in the patient's condition and facilitates rapid intervention. Although this serves to ensure safe care, the security and privacy of patients due to these considerations is considered more problematic (Saba, J. and P. Bardwell, 2004) Visitors are a significant factor in helping patients who need care but are not the only additional individuals present in

ED. Since ED is the link between inpatient care, community and primary health care, some can also be present for a number of appropriate reasons.

The current organizational structure in many hospitals is not conducive to the management of patient processes. Some hospitals may be characterized as a set of in dividual practitioners in an institution that feeds services to them. In the early stages of planning a new hospital, a new management model needs to be addressed and identified.

When the health care consists of one patient with a clear condition, such as a broken bone, and is served by a production team formed of one doctor and one nurse, the challenges of integration and teamwork are not unavoidable. (V. Singh, 2017)

The thing to be incorporatedand organized, the research unit, is a patient case compared to manufacturing, administrative issues are intensified by a patient case. While most patients fall under a known diagnostic category that calls for a routine care process, each patient is still an individual. (V. Singh, 2017)

Table 3.8 lists the components of each infrastructure region. Good infrastructure planning is key to successful patient management. The lack of suitable storage facilities, for example, will lead to problems in obtaining critical equipment and preventable delays in medical treatment or insufficient storage can interfere with sanitation in clinical environments. (IAEM, 2007)

Table 3. 8 Patient area usage by IAEM (2007)

Patient access:	***Patient care areas:***	***Inpatient facilities:***
• *Ambulance facilities* • *Ambulance entrance* • *Ambulance equipment storage area* • *Decontamination area* • *Walking entrance*	• *Triage area* • *Ambulance patient triage area* • *Waiting room* • *Pediatric waiting area* • *Sub-wait areas* • *Resuscitation area* • *Isolation rooms (negative pressure rooms)* • *Treatment area / Major's area / Urgent area* • *Special function treatment rooms*	• *Observation Ward / Clinical Decision Unit* • *Chest Pain Assessment Unit* • *Relatives interview room for in-patients* • *Staff duty base*

• *Reception area*	• *Ambulatory care area / Minor's area* • *Nurse Practitioner area* • *Pediatric treatment areas (incl. Adolescent Crisis Suite)* • *Interview rooms for social care* • *Therapies area* • *Quiet rooms / Disturbed patient rooms* • *Patient toilets (waiting room / treatment areas)* • *Baby changing and breast-feeding facilities*	• *Inpatient showers and toilets*

CHAPTER 4

IMPACT OF DESIGN PHYSICAL COMPONENTS ON THE MEDICAL ENVIRONMENT PERCEPTION

Wellbeing may be characterized as a living adaptation mechanism to constantly shifting inner and outer environments, rather than as a constant and fixed state of separate and autonomous self. According to Coates (1997), it is the special responsibility of living organic architecture to stimulate all senses while still engaging the user's will and perception in a conscious method of rebalancing body, soul and spirit.

According to OHA (2010), there are five fundamental concerns for providing an organizational framework for patient satisfaction:

1. *Improving patient care;*
2. *Improving the waiting experience for ED patients and families;*
3. *Providing an atmosphere and care that leads to people's needs;*
4. *Improving communication capabilities of suppliers and customer service; and*
5. *Promote communication and education*

Coates (1997) tries to convey the significance of nature and community, the person and the planet by demonstrating how the building of forms, structures, and components may be modified by the same metamorphic cycles that shape and develop live beings, and by enhancing and clarifying the oneness of architecture, space, and environment. The design of health centers has generally concentrated on practical room quality, which has usually resulted in psychologically demanding facilities that often fail if they are unpleasant or unsuited to the demands of the mental users (Ulrich, 1991). The hospital patient is vulnerable and helpless, and components of the physical surroundings that are unimportant while one is healthy might become critical when one is confined to a hospital bed. (Kornfeld, 1972)

The main aim of architects is to conceive an adequate environment for human beings. (Benoudjit at al, 2000). When it comes to physical environment, according to

J. Carpman (1986) there are “four basic design related needs of patients and visitors in health care facilities" to reach satisfaction:

1. *Wayfinding and orientation, which includes anything from locating the hospital, parking, and access to identifying laboratories and restrooms.*
2. *Physical security, which includes aspects of a hospitalization such as adequacy of space, levels of noise, lighting quality.*
3. *Social connection, which demands the amount of privacy granted as well as the patient's right to control it*
4. *Symbolic meaning, which relates to the signals sent by hospital buildings to patients and visitors.*

There is a need to evaluate hospital architecture, particularly how improved hospital design may assist ease staff stress and tiredness, increase service delivery efficiency, increase patient safety, reduce patient and family stress, increase performance, and promote overall health quality (Hamilton,2003). A lot of study’s results indicate that health care architecture may improve patient care and treatment quality while reducing medical errors and waste (Marberry, 2007).

To construct buildings that enable and encourage the healing process, the architect must be concerned with creating an overall environment that encourages and reflects this complicated task (Coates, 1997). A thesis by Marfo (2007) indicates that a hospital must continuously adjust to changing workloads complexity and urgent circumstances. Moreover, all hospitals should fulfill certain attributes regardless of location, budget or size (WHO, 2007).

In order to build an effective clinical environment, it is also critical to include the expertise of healthcare professionals throughout the hospital's development. Previous research on hospital physical conditions focused mostly on user retention. (Zhao, 2012). According to Rashid's (2007) study, both the interior architecture and the indoor environmental aspects of healthcare facilities are connected to patient and staff circumstances that contribute to user’s satisfaction such as patient comfort, patient protection, patient privacy, family integration with patient care, and staff work environments. Kehlet (2010) highlights that despite the fact that the patients are vulnerable and unwell, the physical environment and the facility interior are seen as

significant factors to the fact that patients want to stay in bed. There are just no alternatives. The design should strive to meet the psychological requirements of all users since poor design will result in negative response from patients such as anxiety, higher blood pressure, and increased need for pain-relieving drugs (Ulrich, 1991).

Physical infrastructure development is a significant weapon in the armory for reducing negative sides like rising healthcare costs, improving health outcomes, helping in the patient and worker wellbeing and morale, and reducing medical errors (McCulllough,2009; Zhao, 2012).

According to Ulrich at al studies (2004), studies are found linking a range of aspects of the built environment of hospitals to staff stress and effectiveness, patient safety, patient and family stress and healing, and improved overall healthcare quality and cost. There is a field that of study that held trustworthy evidence to influence in the design, and that is called Evidence Based Design. In health care this technique is popular to promote the well-being of patients and employees, healing of patients, reduced stress and safety. EBD points to the importance of carefully planned physical environments in enhancing hospitals' safety, promoting patient recovery and lowering the incidence of hospital infection. The results demonstrate the necessity of developing efficient ventilation systems, the right atmosphere, adequate illumination, enhanced ergonomic design and improved floor designs and working conditions. It also enhances the working atmosphere of the workers. (V.K. Singh and Lillrank, 2018)

4.1 Evidence Based Design

Evidence-based design (EBD) is a process for creating health care buildings that are informed by the best available evidence about how the physical environment can interfere with or support activities by patients, families, and staff, and how the setting provides experiences which provide a compassionate, efficient, secure, and patient-centered environment (Ulrich at al ,2004; McCullough,2009; Hamilton, 2003).

Zimring et al. (2008) have identified some strategies for EBD like to star with the problem for example: patient satisfaction, and staff performance, and imagine new Solutions, including patients and families and communicate frequently with all stakeholders about the desired outcomes and potential benefits. Although it is difficult

to conduct rigorous research on the impacts of the healthcare environment. (Ulrich at al, 2004). In these cases, an evidence-based design process is critical to ensure that future healthcare facilities will not add to the stress on our already overburdened healthcare system and will meet the needs of patients, staffs, and families. (McCullough,2009). Dore Shepard (2009) quoted: “The patient should be spending energy fighting the disease, not the environment.”

According to Singh (2017), EBD is not about hospitals that are simply nicer or fancier than traditional hospitals. Rather, the focus of evidence-based design is to create hospitals that actually help patients recover and be safer, and help staff do their jobs better. Many of the improvements suggested by EBD are only slightly more expensive than traditional solutions, if they are more expensive at all (Ulrich at al, 2004).

According to McCullough (2009) successfully implementing EBD principles in the design process involves a combination of streamlining processes, examining new technologies, and then creating a design that can adapt over time to accommodate improved processes and new technologies. It should therefore be a comfort to them to know that important design concepts have, in fact, been tested and that there are data available to inform their medical designs.

4.2 Wayfinding/orientation in healthcare facility

Often buildings are designed to offer its occupants a feeling of building orientation and maybe spark out that mental map, which informs them where they are and points them to where they must go. (Lehman,2016). Weisman (1981) suggested that overall configuration, signage systems, visual contact, and space differentiation of an architectural environment are related to wayfinding design. According to Mollerup (2009), architecture is critical for natural navigation, with location and appearance being two important considerations. The position and connection of buildings together with the position of functions in buildings affects the distance to be traveled and the manner in which the visitor's expectations have just been fulfilled.

Patients are frequently disappointed by their inability to get to the correct location when they are lost, anxious, or disoriented (Carpman et al, 1984). Physically

and mentally, patients under immediate assistance are anxious and are usually unfamiliar with hospitals and EDs. People should be informed of where to park, how to approach the ED, what stairs to utilize and so on (Carpman, 1986). This will result in their displeasure very rapidly being redirected to the healthcare system and negative impacts on their hospital experience.

The magnificence of confusion or loss may already be an inquisitive circumstance. The worsening loss is one of the main concerns of healthcare visitors. While at first blaming themselves for being unable to find their way, they quickly shift their displeasure on the institution. The negative effects on the image, confidence and trust are crucial for the hospital and its caregivers (Murphy & Brown, 2010). An important factor for troubleshooting is the reduction in capacity of many patients and other visitors of either sort. Fear is not known to increase patients' or visitors' capacity to locate and identify. (Mollerup ,2009)

Carpman et al. (1984) explained that a way-finding system usually consists of three main elements:

1. *design-related elements*
2. *operational elements*
3. *user behavior.*

The portion regarding signage systems and wayfinding visual contact is most often produced in decision points of actual paths and not understood in the perception of the user (O'Neill, 1991). So many scholars viewed a system of signage as the most important design feature (O'Neill, 1991; Gargiulo, 1994; Carpman et al., 1984).

When you get to a hospital, you need signs for your route. Signs essentially perform main functions at the hospital. To begin, signage indicates the hospital's departments, services, and rooms. Second, signs guide people to areas of the hospital that are not visible from the placements of the signage. Signs tell the hospital about its role, for example, by notifying us of hours of opening (Mollerup, 2009). Carpman et al. (1986) conducted video simulation research on the parking lot and discovered that the existence of the entry to the deck of the drop-off circle had a substantial impact on

turning behaviour. While it can assist to locate signs and other directions within buildings, a smart architectural design should not rely on signage only. (Lehman,2016)

Medical centers have naturally complex surroundings The combination of a complex and potentially weak environment demands well prepared guidance. Patients frequently move across multiple areas/units to their intended destinations. A faulty system can create anxiety, uncertainty and unhappiness with a person's experience at a hospital (Ulrich, 2005). Inherently, the design should provide its inmates a feeling of where they are and an awareness of how to reach where they want to go, as Maria Lorena Lehman states (2016).

In some areas, visitors demand some functions to be at a certain location. It is simple to understand why not always all functions are most rational in huge hospitals in terms of their position (Mollerup, 2009). Interior signage and outside signage from a design point of view should be ideally consistent within a single system in order to avoid confusion and improve travel (Carpman, 1984). Exterior building cues are critical components of a navigation system. The absence of any indications or signs, unknown medical language and incorrect service location, add only to the difficulty of the visit. (Carpman et al., 1986). Different departments may appear different, but restroom doors should look the same wherever they are needed (Mollerup, 2009). Eliminating needless signaling, positioning of signs, color and form, and avoiding the complicated array of indicators are some essential factors. Other relevant aspects include landmarks, lighting systems and landscape design. During renovations, some health centers can grow, transfer or shift departments, keep the signs and maps up to date and guarantee the entire system of information consists of the appropriate information. (Carpman, 1984).

In addition, Mollerup (2009) reports that there are multiple reasons for difficulties in hospitals. One apparent explanation is the frequently complex environment in which hospitals are built. When the hospital was created, there was presumably a clear plan. However, the noble intentions of the original planners might be undermined by subsequent additions and alterations. A second source of difficulty for many patients and visitors to find their way into hospitals is that the hospital has been reconstructed or relocated for the first time, since last visit.

An enhanced system of tracing not only helps the hospital minimize hidden costs but also addresses the diverse mobility and cognitive demands of patients because of the diversity of the hospital locations. At the research done by Ulrich et al. (2005) report that the yearly costs of a tracking system exceed $220,000 per year. Such hidden cost is often associated with the lost time from staff members giving directions to visitors and appointment delays. But a good method for identifying signs and color lines on floors isn't just a good approach. It is an integrated system that has coordinated parts, a wide variety of spatial interactions and a well-planned physical environment. (Carpman et al, 1984)

4.3 Spatial perception

Space has concerned architects and urban designers since the emergence of architecture as an independent field (H. W. Kruft, 1994). Though, architectural theory considers space as one of its main concerns, it seems that space still hard to define and to situate. The definition of space is relative to an individual's perception from a specific point of and at a specific given time. The only way to fulfil a global, non-personal, objective definition of the space is by understanding the mechanisms underneath the human perception, and the phenomena that influence on it. (Benoudjit et al, 2000)

But definition of space depends on some factors. The indirect definition of space stated from some theoreticians are due mainly to the following reasons:

1) Human perception is not free from the observer's emotional content, Therefore, the judgement and thus the definition of space might be unsatisfactory, as each individual see it in different way (Schull, 2001).

2) As our environmental experience and space interpretation depend on the purpose of the observation (Lynch, 1960)

According to Peret C et al (2011) spatial perception is the capacity to understand your connections with the environment around you. The phenomenology of visual space refers to its local attributes (like perceived direction, perceived distance, perceived size, and perceived motion) as well as its global shape and scale (Loomis,2003) or when Peret C (2011) states that when we speak about spatial

perception, we typically mean the 'space' surrounding us: things, components, people, and so forth.

Good spatial awareness makes it possible for us to grasp the environment and its interaction. (Peret C et al,2011) In a paper dealing with visual space, Lehar (2003) argues that research on visual space perception needs to focus on characterizing the spatial correspondence between physical space and visual space, which will then act as a powerful constraint on a computational theory of visual perception. Space is part of our thoughts, because it is there that we bring all our experiences together. Spatial perception also involves a knowledge of the connection between two things when their position in space is changed. It helps us to think in two and three dimensions, enabling us to see and recognize objects from various perspectives, irrespective of how they look. (Peret C et al,2011). There is strong evidence that action is sometimes controlled by visual space.

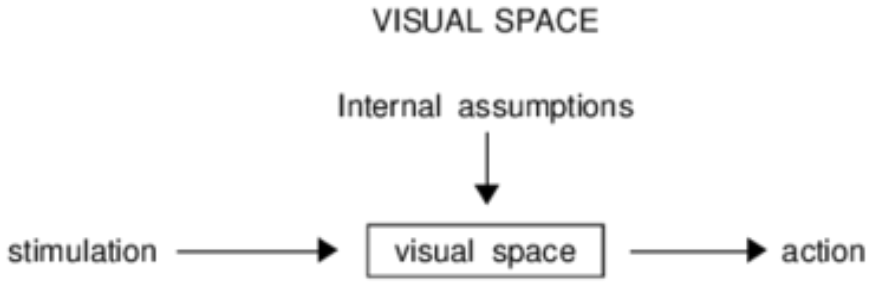


Figure 4. 1 Conceptions of how vision controls actions (Loomis, 2003)

There is compelling evidence that visual space may occasionally regulate action (Figure 4.1). In addition to internal beliefs about physical space, the visual interpretation of the light stimulation leads to visual space, the visual component of the perceptual space. This perceptual representation is also a causal factor for action. According to this notion, visual spatial comprehension will help our understanding of action (Jack, 1998).

Conceiving a suitable space means that first we need to define the space and second to find a way to observe it and to understand it as it is perceived by its future users. In other word, to create a tool that substitutes the users by predicting the space based on their perception of it. (Benoudjit et al, 2000). The design of the hospital is no

exception, which means that the overall space must be as sensible as practical and adequate for the purpose it will serve. (Diane at al, 2000) Sometimes, the design of a medical institution is similar to that of a labyrinth with a lot of twists and few reference points. The architecture and design of hospitals is often ignored by architects and administrators who generally have the last say (Carpman, 1986). The overall square footage contributes greatly to the hospital's design, construction and operational costs.

The fact that the buildings in most medical facilities are not all created once is also a predisposition for the user to forget about structures. New structures and wings have been added to older installations and so the overall plan is inconsistent. For example, floors may not align: patients can enter the fourth level of a building only in the fifth floor of another building on a catwalk (Carpman, 1986).

Patient rooms typically do not have enough security and silence and darkness to relax. Often patients are overlooked, put into overcrowded, unpleasant waiting areas, and are denied basic necessities because they fear that hospital workers will have to satisfy specific requirements. (Carpman, 1986)

They are not the focus of design, even if waiting rooms or storage sections may be required. Flexibility, for volumes, must also be addressed in the short and long future. We need to provide a slow, medium and busy flexibility for the personnel at short notice. Rooms should be designed to make it easy, safe and fast to transfer clinicians and doctors. (Diane at al, 2000). Studies made by Sandman, & Norberg (1987) shows that single rooms are significantly better for the presence of families and friends than multi-bedroom. The open-plan multibed rooms restrict the presence of families and thus decrease social support. Multi-bed rooms considerably diminish privacy in comparison with single rooms for patient-family interactions and are far more likely to have limited visitation times. The clearly defined benefit of single rooms to promote social support is that they give more space and furnishing for a family than double rooms (Chaudhury et al., 2003).

The necessity for social interaction between individuals is emphasized in studies that address the benefits of single-bedrooms and multi-bedroom rooms, and interviews with multi-bedroom patients, all of them characterize the major reason for that decision as the element of social support and balance. (Andersen et al., 2008;

Chaudbury, 2003) It is, however, impossible to identify the optimal bedroom type for patients in general, since research shows that preferences vary based on condition, personality, and a variety of other characteristics (NHS Estates, 2005). Furthermore, according to several research, roommates are the primary cause of exhaustion and stress due to lack of privacy, disturbance and interruption of sleep and generally undecided company (Andersen et al 2008).

Extend the square footage and u extend everything. (Diane at al-2000). According to Jocelyn M (2016), in the long run, we must understand which services are most prone to be affected if we do need to expand. Can the facility support expansion in such areas? How do rooms are agile enough if the patient mix moves from one treatment area to the next? In general, the aim is to reduce overall square footage by 15% - 25% by creating a lean lens. It is because the work being so efficient it can save so much room. Just consider about how much the one notion of waiting is costing. Everything is affected by longer patient wait times. Greater wait times imply longer lengths of stay. As a result, individuals are staying in the hospital for longer periods of time, necessitating the use of additional rooms to accommodate the same number of patients.

4.4 Movement and overcrowding

According to McHugh (2011) many emergency departments (EDs) across the country are crowded. Overcrowding in the ED is an international issue and can impact on the patient 's experience and the clinician's ability to carry out appropriate care in the ED. When capacity is exceeded, there are heightened opportunities for error. (Bartlett, S. and D.M. Fatovich, 2009).

Eds in America operating in or above capacity, state that ED patients are holding or "boarding" while waiting for hospital beds. (McHugh, 2011). The overcrowding creates emergency dysfunction: it involves extended waiting periods, greater delays in hospital admission and even infectious illness spread (Richardson, 2014). Several studies show that ED overcrowding leads to poor quality treatment. (Christianity, 2011).

Flow is achieved by the elimination of waits, pauses, flexibilities and improvement of the process. Improvement of ED efficiency and performance has several advantages including improved patient satisfaction, higher income and decreasing ambulance diversion (Zun, 2009). Greater waiting equals more space in the waiting area. Greater waiting implies that all central facilities, including the cafeteria, parking, and corridors, are larger. The key is to build the hospital around value-added services rather than wasted resources. This will significantly lower both the footprint and the cost. (Jocelyn M, 2016). Although delays in ED decrease, client satisfaction would surely rise.

Architectural concepts can be used to enhance patient flow and communication among staff members in facilities that have the chance to design or remodel the ED (Ed Manag, 2009). ED patient flow follows a pretty regular pattern with triage, registration, care assessment and disposal. Patients who have been treated to Fast Track had lowest acuity and main complaints similar to other EDs. The patients seen in the control section, like Triage, had a medium level of acuity states Richardson (2014)

If there is no ED cubicle available, patients will rather wait in ward hallways for their ward bed. The least desired choice is to wait in the ED corridor. Usually, patients expect to reach the bed in 3 hours. However, the patient expectations of waiting periods for a bed are often not satisfied with high levels of access block. (Bartlett at al, 2009).

Patients felt that the ward rooms were calmer, less messy, a "step closer" to a ward and closer to their health care teams and care personnel. Patients who preferred to stay in ED corridors felt that medical attention would be available more quickly than on the ward. They also felt that there would be more privacy in an ED corridor, as this would avoid being seen in the ward corridor by the public visiting ward patients. (Bartlett at al, 2009). Overcrowding can intensify by access block as patients wait for long periods in ED corridors before ward beds are available. (Bartlett, S. and D.M. Fatovich, 2009). A study by Richardson (2014) showed that overcrowding is related to the increase of deaths occurred on the ED.

But in cases that there were no ED cubicles, the patients preferred ward hallways to ED hallways. The practice of patient reception is, of course, undesirable in hallways but represents the hard reality of the current situation in terms of capacity. (Mc Hugh,2011).

4.5 Noises

Much research has examined the effects of noise on patients, but comparatively few studies are available for healthcare staff. There is evidence that staff perceive higher sound levels as stressful. Noise has been proven to be a negative environmental stressor for patients, families, and staff. (Garcia, 1995; FGI, 2007). Noise should be minimized by the design of the physical environment and the selection of operational systems and equipment. Recreation rooms, exercise rooms, equipment rooms, and similar spaces where impact noises may be generated shall not be located directly over patient bed areas or delivery and operating suites, unless special provisions are made to minimize such noise (FGI, 2006). Many functions undertaken within an ED require consideration of acoustic privacy and noise attenuation. Requirements will differ in various rooms and functional zones within the ED and consideration needs to be given to minimizing noise transfer between zones where necessary (AHAI, 2019). Acoustic privacy for patients must be balanced by the need for patient observation, care requirements and staff safety in all areas. In the main treatment areas, optimal infection control and patient considerations favor the use of ED cubicles with. (IAEM, 2007)

Noise-induced stress in nurses correlates with reported emotional exhaustion or burnout (Topf & Dillon, 1988). A study by Blomkvist et al. (2004) examined the effects of higher versus lower noise levels on the same group of coronary intensive-care nurses over a period of months. Lower noise levels were linked with a number of positive effects on staff, including reduced perceived work demands, increased workplace social support, improved quality of care for patients, and better speech intelligibility.

4.6 Lighting

The quality and intensity of natural light have improved health outcomes. Lighting should conform not worsen the condition of patients and staff (AHIA, 2019). Recent studies have also demonstrated substantial medical mistake reductions with better illumination. Increased daytime light in ED can also affect energy use and the development to accommodate available natural light. It can also boost the well-being of staff (HBN,2013). According to Fox & Henson, (1996) nursing staff members are also open to risk of injury from medical equipment such as high-intensity surgical-light sources. One study found that a light source used during surgery could potentially cause retinal damage in surgical staff). Natural lighting contributes to a sense of wellbeing, assists orientation of building users and improves service outcomes. The use of natural light is highly desirable especially in the SSU, pediatric zone, safe / behavioral assessment room, the main waiting area and staff room (AHIA, 2019). It is essential that a high standard focused examination light is available in all treatment areas. Clinical care areas should have exposure to daylight wherever possible to minimize patient and staff disorientation (IAEM, 2007)

CHAPTER 5

EMERGENCY DEPARTMENT OF REGIONAL HOSPITAL OF SHKODRA

The Regional Hospital of Shkodra is located on the North-East part of the city. It is a peripheral area located 6 min by car and 20 min walking from the city center. It is one of the most important units of the Shkodra, considering its humanitarian purpose. According to WHO (2017) falls under the classification of a Government and General Hospital as for Mulligan at al (2003) it's a secondary level hospital/ Regional Hospital. The hospital it's a campus of rectangular buildings of different stores, pavilion type, all connected by long halls. Some of the other departments are Maternity which is directly connected with the Emergency Department, Cardiology, Intensive care unit, Pediatric intensive care unit, Neurology, Oncology, Obstetrics, Gynecology etc. We are going to take in consideration for our master thesis, the Emergency Department (ED) only. ED is located on the East side, on the first floor of the building. AHIA (2019) and IHF (2019) states that Emergency Departments that have 5-15 treatment space are considered small. Considering the size of the hospital, ED occupies a pretty small area of it.

Figure 5.1 Emergence Department top view (Asig Geoportal, 2019)

ED is located at a secondary road to avoid crowding since it deals with emergencies and can't afford to get stuck. The hole facility has 2 entrances *(Figure 5.1)*, one reserved for ambulances and people approaching the ED to take treatment. Every department has its own connection within the outside roads and yards. Although there is only one exit for all the vehicles, no matter the department you use *(Figure 5.2)*

Figure 5.2 Outdoor entrance and exit (Asig Geoportal 2019)

During the years a lot of changes have been made. The changes consist mainly on the interior of the Emergency not so much on the exterior except some minor superficial

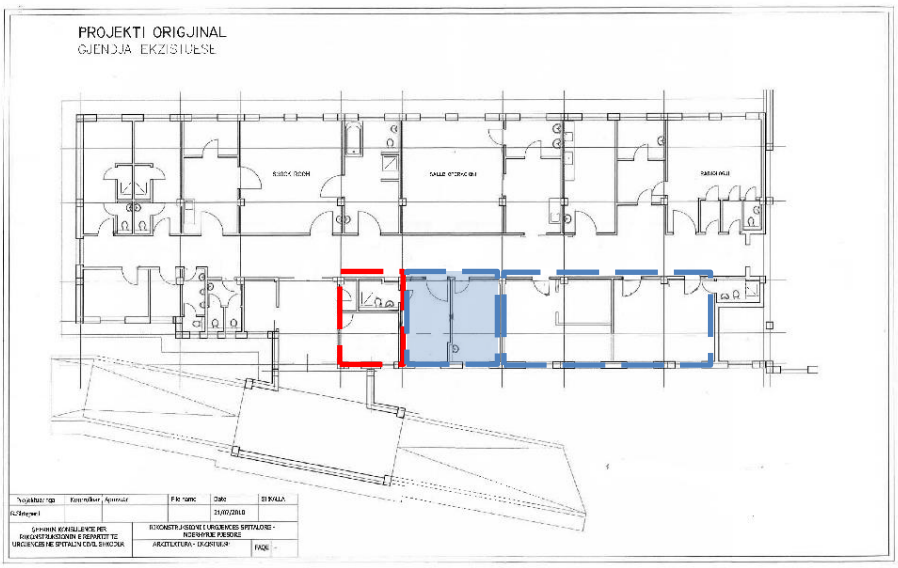


Figure 5.3 Remodelation of plan from the archives of the regional hospital of Shkodra, 2010

interventions. The earliest plan there is, is that of the 2010 *(Figure 5.3)* which shows the original plan of the unit before the remodulation made in that year. What we see in the picture are the divisions the unit had when it was first built in 1943. There is no evidence that the ED has been changed before 2010.

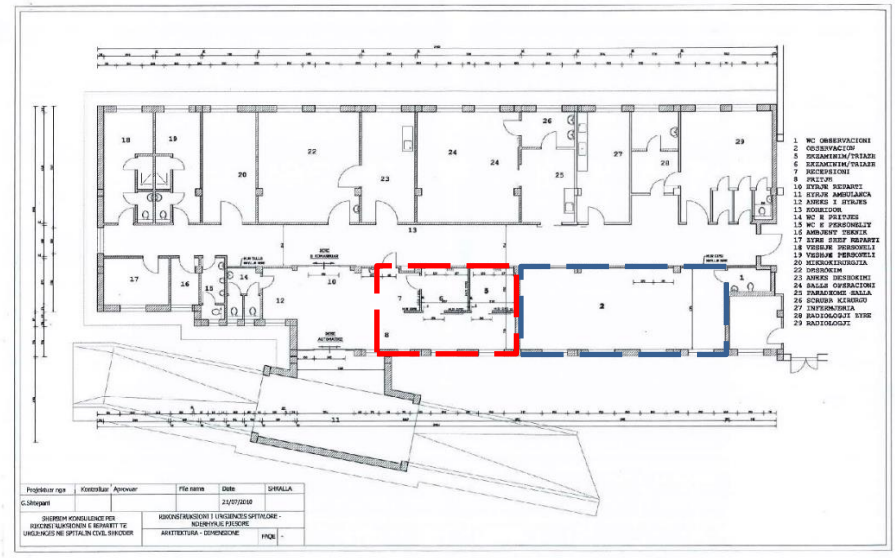
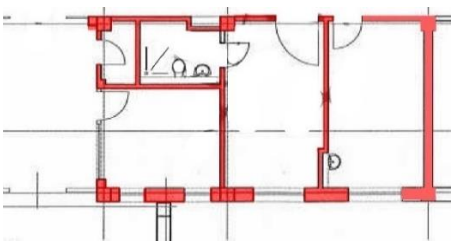
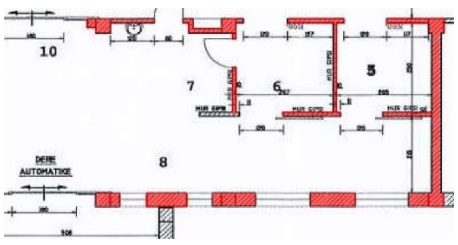


Figure 5. 4 Plan of plan from the archives of the Regional Hospital of Shkodra, 2010

On *Figure 5.4* there is the plan that shows the changes that have been made, consisting on moving the division walls to make some spaces larger based on the unit needs. In 2010 the Department made some reconstruction of the interior, interfering in some parts of ED. As you can see the triage area has been changed. Some of the separation walls have been removed to create more flowing areas (Figure 5.5 A-B). There used to be 2 multi-patient rooms, 2 one-patient rooms, and 1 triage room which was separated from the entrance with a curtain, with no waiting area (people used to wait on halls) and some of the rooms had different purposes comparing to what they are used today.

A) 

B) 

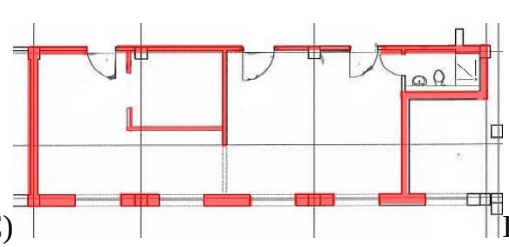
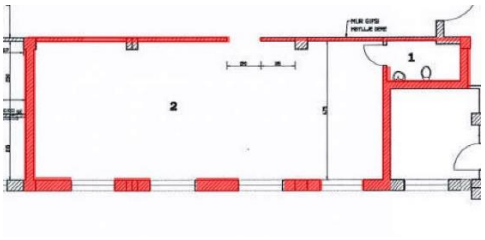
C)  D) 

Figure 5.5 (A) Original plan of triage,1943, (B) Remodulation plan of triage, 2010, (C) Original plan of Observation,1943, (D) Remodulation plan of Observation, 2010

In 2010 the multi and one-patient room changed their purpose. The multi-patient room opened into a larger space, today the Observation room. In *Figure 5.6 (A)* we see the triage/ reception area with no decent place for public waiting, and the entrance hall *Figure 5.6 (B)* being used as an equipment storage. The one-patient rooms became part of the triage, also the information desk became open. The architects removed the rooms and placed them with open areas, creating more space on the entrance for patients to have a larger place to take their first aid (Figure 5.5 C-D).

A)  B) 

Figure 5. 6 (A) Triage/Reception area, (B) entrance, EDs social media (2014)

In October (2018) the Emergency Department made some changes again. They added 2 more beds, from 4 that used to be, in the Observation room by adding to its space. The area added to Observation room made the triage and the waiting area smaller. Now in the total of 6 beds, the patient's capacity to get medical assistance was raised (*Figure 5.7*).

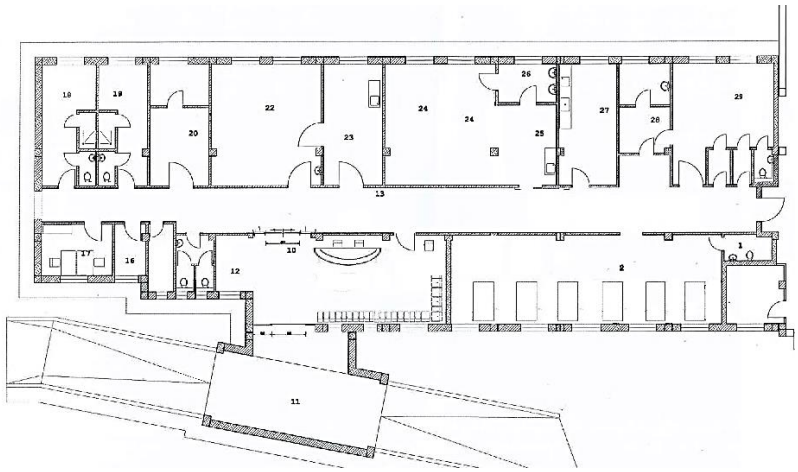


Figure 5. 7 Remodulation plan, 2018

5.1 Functional areas of ED of Shkodra Regional Hospital

Today's ED composite parts are as shown in the *Figure 5.8.*

1. Observation Room
2. Observation WC
3. Triage
4. Waiting Hall
5. Reception
6. Unit entrance
7. Ambulance entrance
8. Entrance annex
9. Hall
10. WC
11. Storage
12. Technical cabine
13. Head nurse room
14. Nursery
15. Doctors room
16. Micro-surgery
17. Shock Therapy
18. Deshock annex
19. Surgery room
20. Surgeon preparation area
21. Radiology office
22. Radiology
23. Service rooms

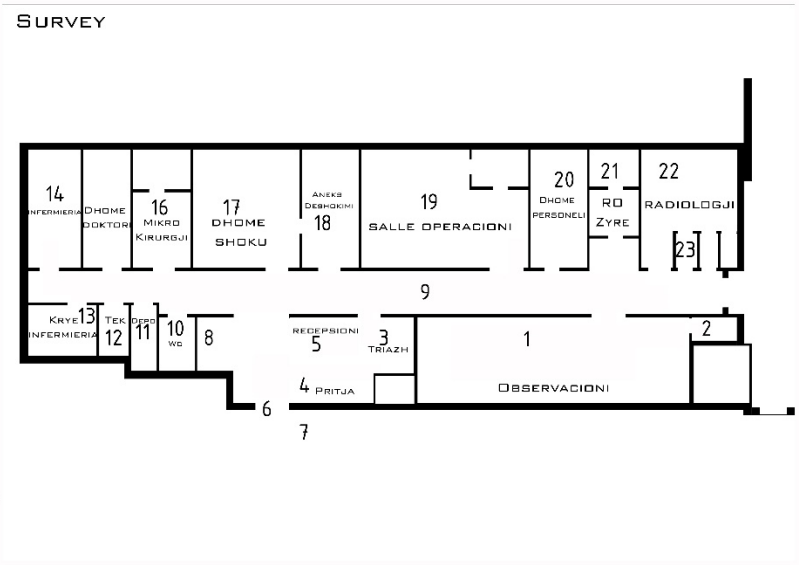


Figure 5. 8 Actual plan components, (Bushati,2019)

5.1.1 Unit entrance/ Ambulance entrance

The unit entrance serves for the ambulances and patients (that approaches the ED by a personal vehicle in a state of emergency need of care) to get the first aid by medical physicians or nurses. It has a ramp and its covered-on top. Patients get to the main door where they get a code for further procedures, based on their condition.

The unit has two separated entries, one for the blue and red codes and the other for the walk-in patients with a code yellow, green or white (*Figure 5.9*).

Figure 5. 9 Inside entrance (Bushati,2019)

Figure 5. 10 Ambulance/ambulant entrance (Bushati, 2019)

There is only one ambulance and vehicle entrance (*Figure 5.10*). U can park your car anywhere on the yard but the ambulances park only on front of the emergency and at the west side of the building (*Figure 5.11*).

Figure 5. 11 Parking (Bushati, 2019)

Entrance annex (*Figure 5.13*) it is placed on the left side of the unit's entrance. Its purpose is to place the barrels and the wheelchairs for the patients to use when arrived or the inpatients.

Figure 5.12 Entrance annex/ equipment storage (Bushati, 2019)

5.1.2 Reception/ Triage

Triage is the space where the patients have the first contact with the staff. It is on the right of the building entrance. The patients are divided into current rooms respective to the service they need. According to the hospital jurisdiction the patients are grouped by the emergency service they need. There are five codes named by colors that differentiate the patients (code: blue, red, yellow, green, white). Code blue requires the nurse and the doctor to give immediate medical assistance, code red requires the immediate assistance by the nurse and within 15 min by the doctor, code

yellow immediate assistance by the doctors within 30 min. Code green and white are for patients that doesn't need immediate treatment, they can wait for 1-2 hours before they see the doctor.

In our ED triage, the reception and the waiting area are placed in the same big space. This approach was part of the remodulation in 2018. Colors used for the walls are yellow and orange.

Figure 5. 13 Entrance to waiting area, reception (Bushati,2019)

5.1.3 Public waiting area

Different from the general EDs where we see a special waiting room for the patients' relatives here, we find a small area that is used for the same purpose. Consists on a long couch in front of the reception which ends at the triage area (Figure 5.14). On the walls there are explanation of the codes and what they represent. The visitors are accommodated here, patient and relatives too until someone takes care of the patient.

Figure 5. 14 Public waiting area (Bushati, 2019***)***

There is also a small area where the nurse monitors the blood tension of the patient. A white curtain divides it from the waiting hall.

5.1.4 Observation room

It is one of the most important rooms in the ED with an area of 47 m2. It is located on the North-East part of the building and it is near the triage. It has been nearly renewed on October 2018. Has the capacity to contain 6 beds, so it can only accommodate 6 patients at once. Beds are divided by green curtains to create some privacy between the patients (*Figure 5. 15*). In 2010 the Department made some reconstruction of the interior, interfering in some parts of ED. There used to be 2 multi-patient rooms, now you find only one big space which includes beds, an information desk, handwash and medical equipment's. The purpose of this change was to have better control on all the patients, better circulation and to better keep an eye on their needs.

Figure 5.15 Observation Room (Bushati, 2019)

Figure 5. 16 Observation Room captured from the right side (Bushati, 2019)

There is a desk (*Figure 5. 17*) and the tech machines are used for the patient monitoration and treatment. Few relatives, beside the staff, are allowed to enter this area to companion the patient based on the flux the room has under the rule of keeping quiet.

Figure 5. 18 Observation room captured from left side (Bushati, 2019)

Wet space

It is placed inside of the Observation room (*Figure 5. 19*). Has no proper utilities for disabled people. Lacks of hygiene materials too.

Figure 5. 20 Observation wet space (Bushati,2019)

Corridor

Figure 5. 21 ED hall (Bushati, 2019)

The hall is the longitude that connects all the areas of ED. It has a width of 180 cm from the Head nurse room to the storage and then its wideness at 240 cm.

Public wet space is placed near the storage at it is used by staff and the relatives (*Figure 5. 23*). There isn't a separate wet space for staff only. Head nurse and doctors' room have private toilets.

Figure 5. 22 Public wet space, (Bushati,2019)

5.1.5 Resuscitation/shock room

It is the room made with 4 beds (*Figure 5. 25*)for patients with more critical condition. It is placed near the Micro and the DE shock annex. Here are placed the patients with more serious injuries. Requires a lot of quietness since mental condition of the patient might be very fragile.

Figure 5.24 Shock therapy room, (Bushati, 2019)

It is the area for inpatients that need emergent surgery are taken care of. Has direct access from the emergency entrance to avoid the crowding since time is a crucial factor for the patient wellbeing.

5.1.6 Radiology

It's the room where X-rays are done. Only the patient and the doctor it is allowed to enter. Inside has 3 other rooms: Radiology office and 2 Service rooms. It's positioned on the right side of the unit main entrance. It is close to the resuscitation room.

5.1.7 Staff area

Staff area is far from the Observation room. Consists on head nurse room, nurses' room and doctor's room. Its near de-shock and micro-surgery room which both are used as equipment storage.

CHAPTER 6

DATA COLLECTION, RESULTS AND DISCUSSIONS

EBD method helped the research on collecting data that had in the center of attention the users of ED. According to some limitations this study was divided into different approaches to different kind of users. To capture the role of space in ED users' experiences as adequately as possible, data were collected at the department itself. Throughout her stay, the researcher made observations to obtain a better understanding of the department's (spatial) context. The whole process of data collection consists on surveys, interviews, questionnaire, taking videos and pictures to help the research.

The target group to be observed, questioned and interviewed were the patients, staff and visitors. From the patients, 39 had the desire to answer and 2 visitors were under surveillance. The staff in total were 26 people, 6 doctors where only 4 answered, 14 nurses where 11 answered and 6 sanitarians where all of them participated. The whole process of data collection happened in the time frame of two weeks.

From the analysis we got different data and opinions on how the user's percept and experience the space in the Emergency Department. Patients had different approach of the perception from the staff for different reasons. The concentration on different areas helped their kind of thinking, on the way the spatial problem is taken as.

6.1 Space analysis

"The function of the Emergency Unit is to receive, stabilize and manage patients who present with a large variety of urgent and non-urgent conditions whether self or otherwise referred "(Griffin,2015). Our emergency department responds to the people of the region 24/7 with all kind of urgent and non-urgent need of care. Different areas of the unit host different kind of medical conditions. From the literature we got the data on the adequate space dimensions for the ED unit. Each space had a minimum of area that could work for a good endurance on the staff performance and patient

experience. According to Facility Guidelines Institute (FGI) (2001), DHS (2004), HFB (2019) and AIA (2006) grouping the Unit is categorized by its functional areas. According to literature the minimum of an areas an emergency must be:

1. Grade level entrance
2. Paved emergency access
3. Public waiting
4. Observation and treatment room(s)
5. Trauma/cardiac rooms for emergency procedures, including emergency surgery
6. Decontamination area
7. Radiology
8. Storage rooms
9. Pediatric treatment rooms

At our case study some of the areas are missing. Decontamination and the Pediatric area are non-existent, they are neither near nor in the unit. On this time of global pandemic, Decontamination area it's a must for the department. The pediatric missing zone creates a problem on managing kids that roam around, creating more difficulties on the flow.

Entrance

The entrance must be well marked, illuminated and covered. Our case has a well-covered and paved entrance which is suited for cars but not so much for the pedestrians because the entrances aren't separated. From the literature (IAEM, 2007; Heisler, 2014), it's said to be a separation between the two entries, and both must be suitable for stretchers. Ours ED ramp it is used for both vehicles and stretchers. There is plenty of space for car parking.

Triage and Reception

As for the Triage and Reception being the first encounter of the interior of the unit, plays an important role on how the things will progress. According to FGI (2021) and IHFG (2017) the area must have a public wet space, access to water and telephone.

Our ED uses 1 wet space for the public and for the staff and is located on the main corridor that connects the treatment areas. Reception and triage are the first meeting areas that patients have with the nurses/doctors. Its where the ill gets the first medical aid. According to FGI (2021) the reception and the triage must be located in a way that allows the staff to observe the main entrance and the waiting public area. Our ED has a neat area that contains the three spaces of service: reception, triage and waiting area. Reception is well marked and has a view on the waiting area and triage (areas which are almost mixed together). There is not a clear definition on where they are separated. In contrast with the review the reception doesn't have wet spaces near nor public telephone.

Waiting area

The waiting area is visible from the reception. The public waiting area is not divided into adults and children. There is not enough space for wheelchairs, prams, walking aids. For sizing waiting areas, the following allowances, as quoted above from HBD (2013), may be used 1.5 m² per ambulant place (that is, in a general chair), 3 m² per wheelchair place. For briefing purposes, waiting areas may be sized at 1.85–2.25 m² per place. 10% of waiting places must be suitable for people in wheelchairs. A children's play area based on 10% of the number of main waiting places and sized at m² per child (with a minimum space for three children and if there is a higher percentage of children and or people in wheelchairs, this allowance will need to increase to 2–3 m² per place. The capacity of space with less than 10 treatment areas is 7 square meters, making it not enough according to IHFG (2017) study. The minimum of a waiting area with 10 treatment zones is 13.5 square meters for ambulant places, in our ED that space is 12.7 square meters.

Children also need a separated space to play and are usually placed in a larger waiting room with more space than a partition according to studies of Heisler (2014) and IAEM (2017). In our case there is none of this space, children stay close to their families and relatives' seats or companion them around the unit.

Observation

Treatment areas are very important for the satisfaction of the patients. Observation must have a minimum of open floor space of 12 square meters (AHIA, 2019) or 11.15 square meters (AIA, 2006). In our case the open space is 14,1 square meters. According to Heisler (2014) and AIA (1992-93).

Resuscitation/ Trauma Room

Resuscitation area must be at least 25 square meters or 35 according to IHFG (2017). In our care this area is 26,8 square meters.

Radiology

Radiology is fully equipped according to the standard. Staff areas are 3 rooms (doctors, nurse and head nurse) where 2 of them have dedicated wet spaces. The corridor that connects all the areas is 2.4 wide from 2.1 that is the minimum.

Functional program

Triage and the Waiting are located at the entry and are liked with ambulance entrance. Staff station is not located at the center so they don't have a view of what happens in the treatment areas, forcing the staff to constantly move to check upon patients adding to the flux of these areas. The ambulance entrance is directly connected to the Resuscitation room in case of emergencies. All areas are relatively close making it easy for fast access. Not all places are accessed by visitors and patients.

6.2 Observation results

Surveys were taken consisting on observation. Observation target were different groups of users, following their tracks during their time of stay on the emergency Department. The researcher took 2 examples for every category to survey. The category were 2 doctors, 2 nurses, 2 patients, 2 sanitarian and 2 relatives during 7 days on a time duration from 12:00 till 16:00. Observations were concentrated on two factors: time of the day and what spaces were more crowded during a week from 3 June to 10 June 2019.

The most walked areas (e.g., the entrance and the hall) were video-recorded by monitoring the user's movements during two different times of the day. These

recordings were used to support the interviews and surveys when needed. Because of the hospital policies only one day we were allowed to make recordings.

All data were recorded, and the results are noted and expressed through the spaghetti diagram. Spaghetti diagram is a tool in use by researchers to "support their visualization and analysis" (Senderská at all, 2017). The *Figure 6.1* explains the track 2 doctors and 2 nurses followed on a time duration from 12:00 till 19:00.

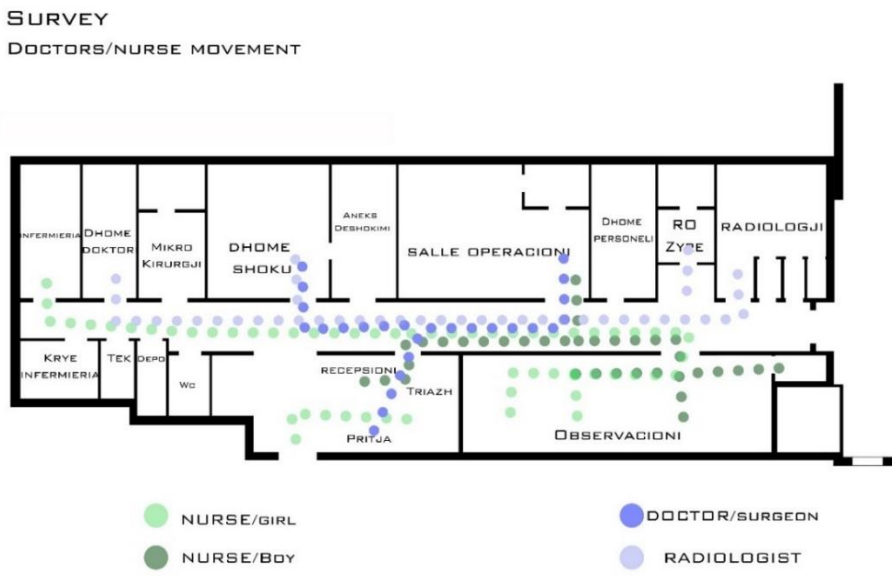


Figure 6. 1 Spaghetti diagram: Doctors and nurse's movement from the survey. (Bushati, 2019)

From the plan we can see that the halls, entrance and the Observation room were more used at that time of the day.

The *Figure 6.2* shows how other staff members and outside users moved during the same period length. From overlying these movements (*Figure 6.3*) we get a better view on which areas were used most from all the users. We can safely say that the most crowded areas are the ones that have access from all. The most walked space is the hall, which does the connection to all rooms. Followed by triage, waiting area and observation room. According to literature these areas are normal to have a lot of movement since its where the most activity happens, also patients and visitors prefer to wait for their treatment in the ED hall and the ward corridor. (Mc Hugh, 2011; Barlett, 2009; Fatovich, 2009)

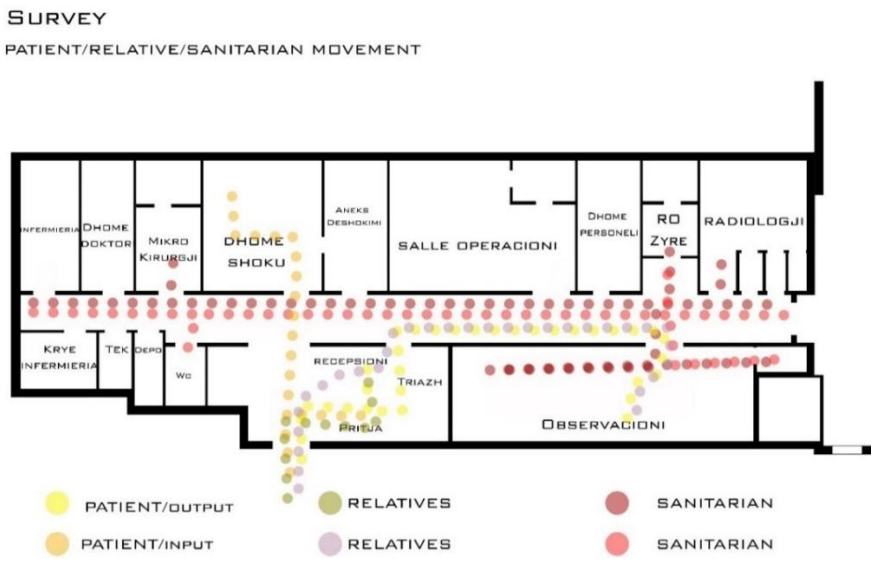


Figure 6. 2 Spaghetti diagram; Sanitarian, patient and relative's movement from survey (Bushati,2019)

Triage is the first area patients and relatives are faced with so it is mostly crowded by these two categories. Since observation room is the space that accommodates patients that are not in an urgent state, that happening to be in higher number that the patients in need of urgent care, has a high circulation and flow.

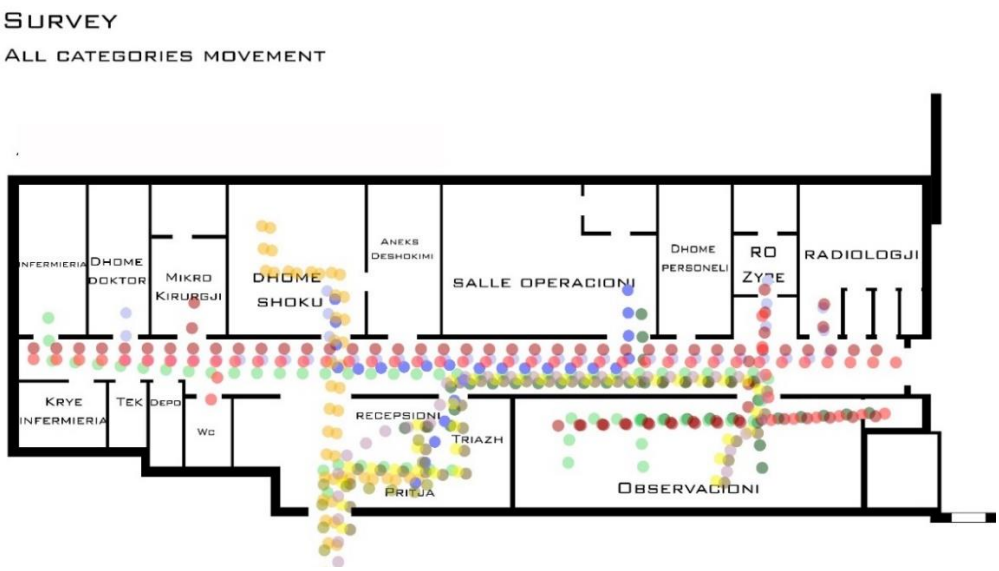


Figure 6. 3 Spaghetti diagram/All movements in one plan. (Bushati, 2019)

To support the user's movement observation, we made video recording of the two important and crucial areas like the hall and the entrance of the ED. Because of limitations we couldn't record in the inpatient areas because of the privacy of the patients and the visitors. The pictures below are the snapshots taken from the recording during the time 12:00-13:00 and 19:00-20:00.

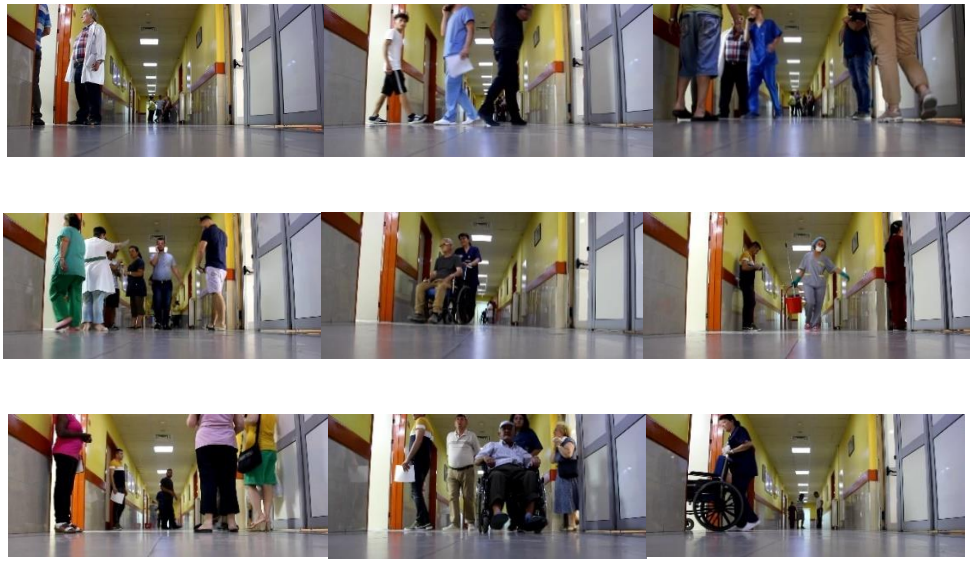


Figure 6. 4 Snapshots from the video recording of hall, Bushati (2019)

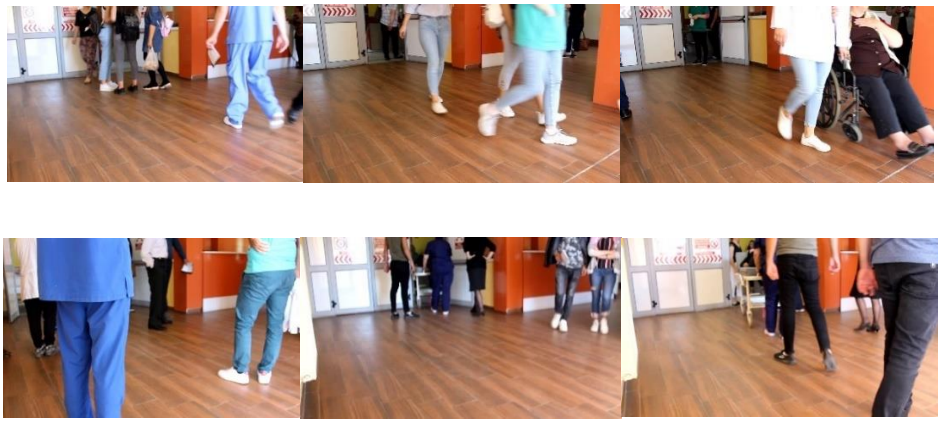


Figure 6. 5 Snapshots from the video recording of entrance, Bushati (2019)

As seen in the pictures in both areas we see users standing, walking or passing with a wheelchair. As mentioned above the pictures prove the statement that the patients and the relatives prefer the corridor to wait for their treatment or time of visit.

6.3 Questionnaire results

As for the staff (11 nurses, 4 doctors and 6 sanitarians), the data were collected by a questionnaire with 21 questions with rounding about the way they experience the environment as an everyday user. Before the interviews, the researcher was helped by the nurses of the emergency department to get more familiar with the areas and photographed all spaces where the patients and staff had access.

6.3.1 Results on the frequency of space usage

Questions were about their work length, on stress they might experience and if they thought the space contributed, what was their routine movements, which spaces did they use the most etc. From the questionaries we got a review on how the staff itself considers the Emergency Department areas, from most to less used. On the planes (*Figure 6.6)* you can see which are the areas mostly frequented from the staff (doctors, sanitarians, nurses).

As we see, the most used area is the hall by doctors, nurses and sanitarians. Differences in role in ED reflects the differences of areas used. Doctors use the Resuscitation, Observation Room and Radiology more, the areas where the patients are taken care of. Must be said that the nurses play one of the most important roles in the ED for frequently taking care of the patients, also by keeping a balance between the medical environment and the outside users. The radius of their movement is larger, touching almost all the areas of the healthcare building, making them one of the main operators of the department. Sanitarians have the same circulation but on lower pace.

Figure 6.6 Area usage (Bushati,2020), (A) Doctor's track (B) Nurse track (C) Sanitarian track

Flow/Movement map supports the area usage. By meeting all tracks, we get a better view on danger points in terms of overcrowding.

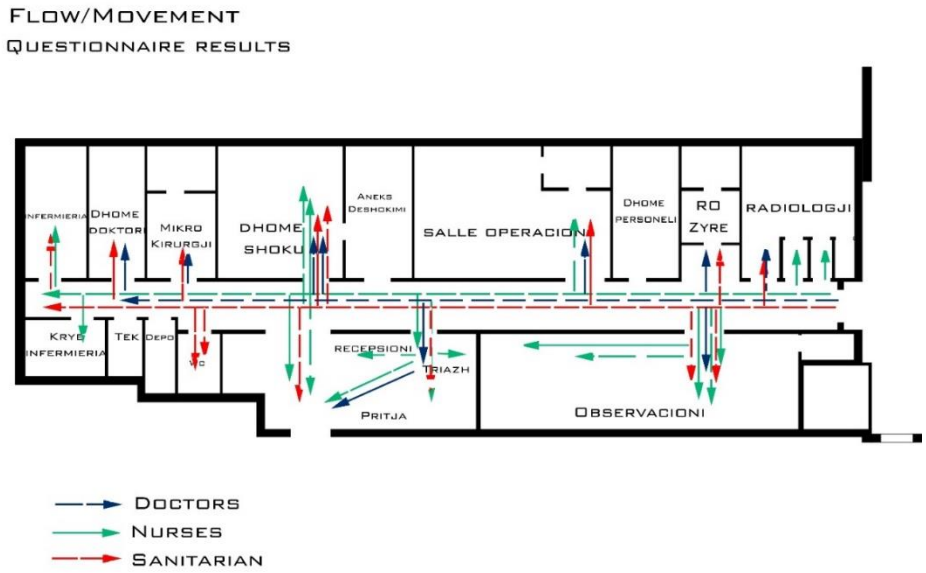


Figure 6.7 This plan shows the movements the staff made according to their daily use. (Bushati, 2019)

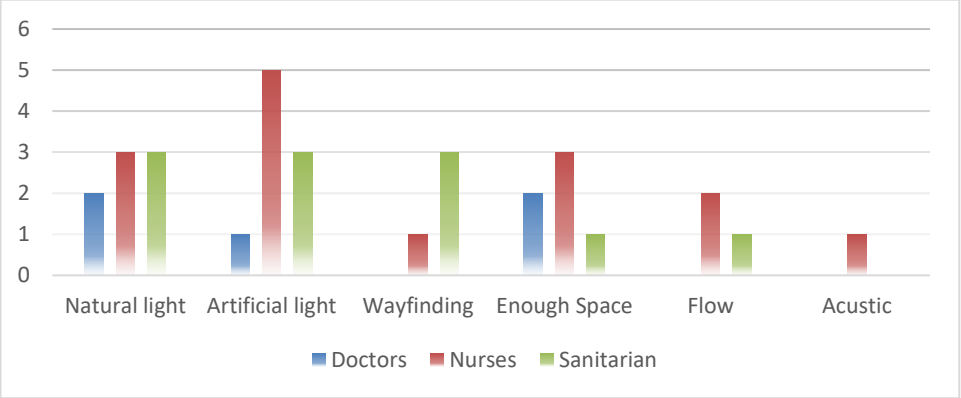
As seen in the (*Figure 6,7)* the most problematic service areas are the resuscitation, the observation room, triage and the main entrance. According to Carpman (1986) patient treatment rooms lack of space and according to Diane (2000) they lack the flexibility for staff to move around, creating overcrowding of users.

6.3.2 Staff evaluation of the environmental physical components

Also questions on the environmental elements like orientation, air conditioning, lighting natural and artificial, room spaces, hall width, circulation and if any of these components affected their productivity in their daily work (Appendix ii). After staff were questioned what works better in the environment they are working on, we got the results shown in *Table 6.1*. As we see the natural and artificial light it is not an issue for them, there is mainly satisfaction with it from the staff. But we can't say the same for all of the components. The doctors don't consider wayfinding, flow and acoustic to be good since none choose them. From the nurses we find almost the same approach. They were satisfied with the light, both natural and artificial, but weren't

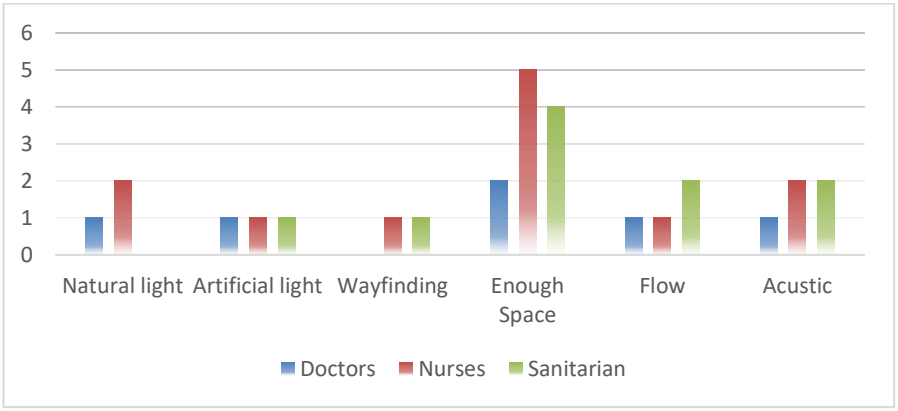
very happy about other aspects. Few picked the wayfinding, flow and acoustic as good functional components. As for the sanitarian the light and the wayfinding are at the right level of functionality. What they find flawed is the space, flow and acoustic.

Table 6. 1 What works better at the environment you are working?



Another question they answered this time, was about which component they had more problems with. The answers shown in the *Table 6.2* gives us a view of their lack of satisfaction on experiencing some environmental elements. As we see the greater problem is concentrated at the space. Nor the doctors, nurses or sanitarians find the space enough to do their job. According to research made by spatial perception

Table 6. 2 What doesn't work at the environment you are working?



Other important questions to highlight were about the spaces they use most of their time, the places they apply their profession. Different users see or percept the spaces differently according to their needs.

NURSES

Almost half of the nurses find the dimensions working spaces on the ED unsatisfying. According to their responses ,1 of them consider the spaces to be very good, 5 of them consider it to be enough and 5 of them consider it insufficient. 6 of the nurses think the waiting are it is not enough in terms of space. So, we have a division of the staff, half of them think that the spaces are satisfying and the other half leaves space for improvement.

Other questions had these results as shown on (*Table 6.3*). Half of nurses find difficulties on circulating on the halls, although the spaces they mostly use aren't far from each other. Most of them don't find the space enough to do their job. When they were asked if their job is tiring and if the environmental elements had to do with it, the majority of them admitted different elements affected their physical conditions. Light and orientation wasn't a factor that affected their productivity, but can't say the same for space, ventilation and noise. Other factors that affected their work had nothing to do with the environment physical conditions.

Table 6. 3 Nurses on valuating the environmental components (Bushati, 2019)

NURSES	*Yes*	*NO*
Do you find difficulties circulatin on the hall?	*6*	*5*
The spaces u mostly use, are they near each-other?	*7*	*4*
Do you have the adequate space to do your job?	*5*	*6*
Is your work tiring?	*6*	*5*
Does these components affect it?		
• *Light*	*0*	*11*
• *Not enough space*	*10*	*1*
• *Wayfinding*	*2*	*9*
• *Acoustic*	*9*	*2*
• *Ventilation*	*9*	*2*

From talking to the nurses (they were the ones that were more ready to answer my question about how the department operates) the usual things you hear were:

• "We need additional room in the hall to cope with the flow better."

•"To be able to take in more patients, we need extra rooms."

•"We need better technological equipment."

DOCTORS

3 of the doctors find the dimensions of spaces on the ED unsatisfying, where 1 of them think it is actually very bad. The data came from their work spaces or the spaces they frequent the most like Observation, Shock Therapy etc. Waiting room area is enough for 2 of the doctors. According to *Table 6.4* doctors were satisfied with the distances between their working environments and in general with the spaces. They found their work stressful but not because of the environmental physical components.

Table 6. 4 Doctors on valuating the environmental components (Bushati,2019)

DOCTORS	*Yes*	*NO*
Do you find difficulties circulatin on the hall?	2	*2*
The spaces u mostly use, are they near each-other?	4	*0*
Do you have the adequate space to do your job?	3	*1*
Is your work tiring?	3	*1*
Does these components affect it?		
• *Light*	1	*3*
• *Not enough space*	2	*2*
• *Wayfinding*	0	*4*
• *Acoustic*	0	*4*
• *Ventilation*	2	*2*

SANITARIANS

Sanitarians are our other group focus that completed the questionaries. In the areas they frequented the most, 4 of them considered the space to be bad and 2 considered the space to be good. None of them though considered the space to be very good or very bad. They were not satisfied with their working spaces. It is a considerable issue since they are the ones that access almost all the area of the unit. Waiting area spaces had a different impact on them, where 3 of them considered it good, 2 considered it bad and 1 considered it very bad. Questions regarding the circulation, most used areas, space and its effects on them had these answers as seen in *Table 6.5.*

Hall is again a difficulty that adds to their job in terms of overcrowding. Noise and insufficient space affect their productivity.

Table 6. 5 Sanitarians on valuating the environmental components

SANITARIAN	*Yes*	*NO*
Do you find difficulties circulatin on the hall?	4	*2*
The spaces u mostly use, are they near each-other?	5	*1*
Do you have the adequate space to do your job?	2	*4*
Is your work tiring?	5	*1*
Does these components affect it?		
• *Light*	*1*	*5*
• *Not enough space*	*5*	*1*
• *Wayfinding*	*0*	*6*
• *Acoustic*	*5*	*1*
• *Ventilation*	*0*	*6*

6.4 Patient flow

The data about the entrances and exits of the patients and relatives were taken from the hospital archive. The data are collected throughout the whole year, January-February of year 2018 and 2019. The statistics are divided in three categories: statistics for outpatients that got no treatment, statistics for outpatients that got treatment but didn't get registered, statistics for inpatients that got treatment and registered. (Appendix iii)

Outpatients that got no treatment - "Visit / consultation", patients who received only visit consultation or no treatment.

Outpatients that got treatment but didn't get registered- "Medication and interventional", patients who received or interventional treatment but stayed less than 24 hours at the ED.

Inpatients that got treatment and registered- "Daily card treatment", all patients treated in the ED for more than 24 hours. (Regional Hospital of Shkodra,2018)

Table 6.6 shows the flux of patients that didn't get medications but only consultation from the doctor. As we see we have Jan, Mar, Jul and Sept with a higher flux of patients. In 2018 we have an entry/exit of 5,132 patients and in 2,019 we have a total of 4237 patients. These patients are mainly centralized in the triage and reception area.

Table 6. 6 Statistics for outpatients that got no treatment, ED of RH, (2018-19)

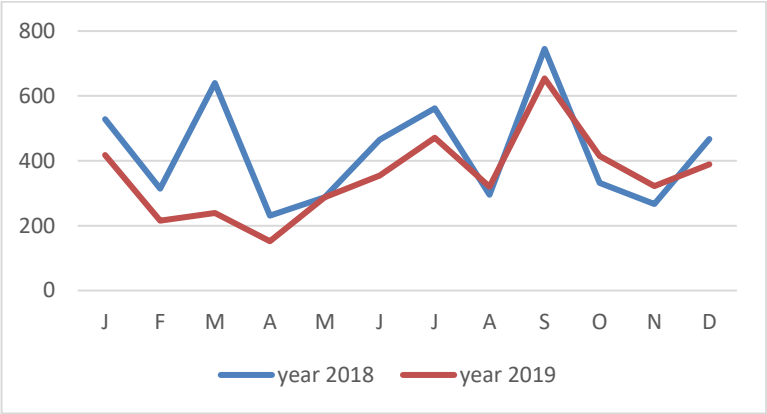


Table 6.7 shows the outpatients that got treatment and stayed less than 6 hours in an emergency bed. The total number of patients was 27,955 in 2018 and 26,608 in 2019. (Appendix iii). These patients are centralized at the triage and the observation room.

Table 6. 7 Statistics for outpatients that got treatment, Ed of Rh, (2018-19)

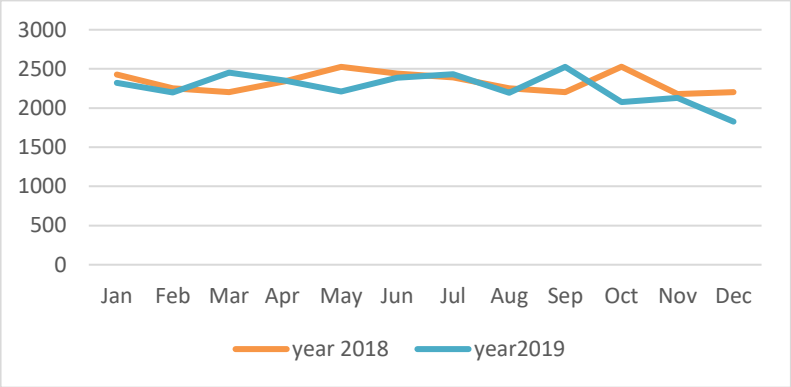
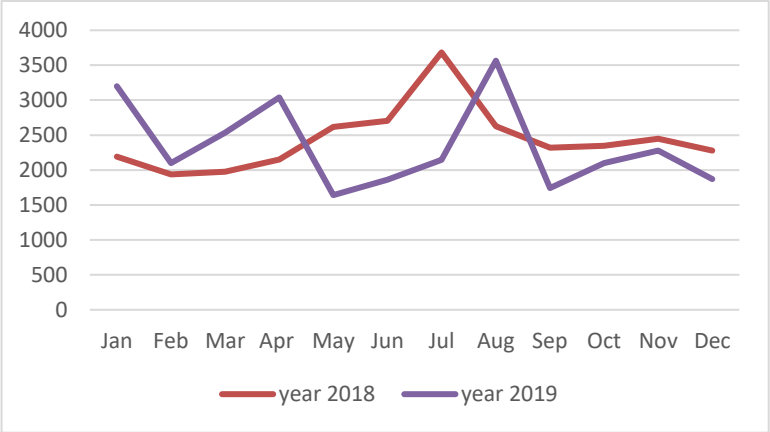


Table 6.8 Statistic for inpatients that got treatment and registered, ED of RH, (2018-19)

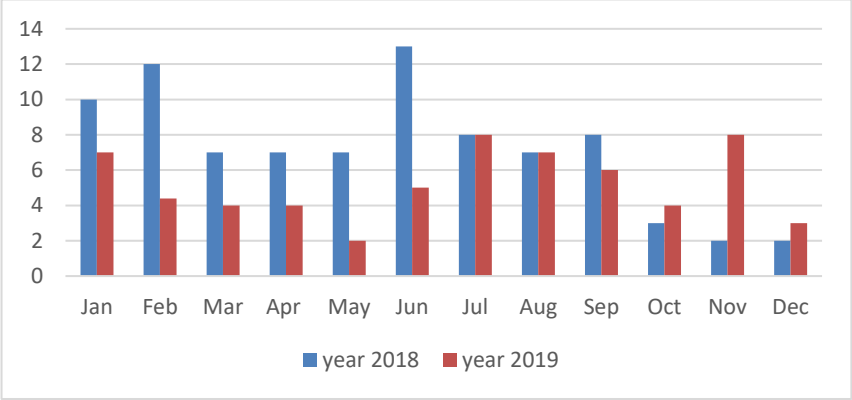
Table 6.8 shows the inpatients that stay longer than 6 hours in the ED. These patients are under constant observation, centralized in the observation and operation room. The number of patients in 2018 was 29,286 and in 2019 it was 29,076.

Table 6. 8 Statistic for inpatients that got treatment and registered, ED of RH, (2018/19)



On *Table 6.9* we have the deaths occurred during these two years. From the literature, according to Richardson (2014) there is a relation between the environment and the medical condition of the patients, resulting even in extreme consequence like death. In total we have a decrease of 42.5% of deaths from year 2018 in which it was 86 people to 48 in year 2019. This huge difference might have a connection with the remodulation that happened in 2018. Adding more spaces in service of patients might have decreased the flux and positively affected their medical condition.

Table 6. 9 Deaths occurred in 2018/2019



6.5 Interview results

Considering the purpose of patients using the ED environments, 8 short questions in the form of an interview were asked (Appendix i). The researcher started each interview by asking for permission to relatives too, especially if the patient was underage. The questions allowed participants to bring up the environmental aspects by being steered in a particular direction. All interviews were audio-recorded and conducted in Albanian.

Patients interviewed:

1. *23 males (age 21-87)*
2. *16 females (age 18-72)*

In order to not disturb the patients, the questions required short answers. The researcher started each interview by asking for permission to relatives too, especially if the patient was underage.

The answers of the interviews are the most surprising. The majority of them had no problem with the spaces, nor the lighting. They had problems with the acoustics.

Participating patients were interviewed while waiting for treatment in their current beds. The focal point was on areas where the patients took the medical care, the Observation room and the Trauma room. Patients were examined at the triage before they can be position into the correct area to get their medical help. What divides the patients into different areas is their condition according to the code they get (e.g., green, yellow, red etc.). The interview consists of 8 simple questions about some of the physical components we have mentioned on the review, more focusing on the space experience. For example: (1) Do you consider the space around your bed enough? (2) Is the toilet too far to reach? (3) Do u need someone to a companion to move around and if yes does this create a problem for you to circulate freely? (4) Do u have enough privacy? Etc. The goal was to interview 50 patients from both treatment rooms. The interviews were taken during 3 days from 5-7 in June, during different hours of the days. From 12:00-14:00 there were taken 7 interviews from the lack of patients, from

19:00-23:30 there were taken 32 interviews since the flux was bigger during the night. The interviews taken into consideration took between 30 sec to 2 min one.

These questions allowed participants to bring up the spatial aspects by being steered in a particular direction. All interviews were audio-recorded and conducted in Albanian.

Table 6.10 Interview answers on ED, Bushati (2019**)**

Answers on :	**Positive %**	**Negative %**
Comfort of environment	76.9	23.1
Sufficiency of space	69.2	30.8
Privacy	94.8	5.2
Distance to other services	74.3	25.7
Need for a companion to move	61.5	38.5
Light	56.4	43.6
Ventilation	71.7	28.3
Noise	25.6	74.4

The Table 6.10 shows in percentage the results of the interview outcome. The majority of answers related to space directly were positive, meaning the patients were mostly satisfied or didn't consider the space adding more to their medical condition. But the same can't be said about the noises or the light in which the positive effect was lower. Noises created by the flux, overcrowding or the absence of acoustic insulation were a factor on creating more discomfort on the perception these patients had of ED unit lowering their satisfaction of their stay. From the literature we find a relation between staff and patients stress and the noise levels. A study by Blomkvist et al. (2004) found that lower noise levels were linked with a number of positive effects on staff, including reduced perceived work demands, increased workplace social support, improved quality of care for patients, and better speech intelligibility.

CHAPTER 7

CONCLUSIONS

7.1 Conclusions on the research

With the aim to have a better understanding of the Emergency Departments, the way they function and what can be done more in these kinds of buildings, the research focuses in the Regional Hospital of the city of Shkodra, Emergency Department. In a hospital beside the frequent users being them doctors, nurses and sanitarians, who can give fruitful feedbacks about the spaces they use every day, is the role of the patients as well. Although they stay shorter in time compared with the staff, their contribution is significant in providing enough data for amelioration of the designed spaces.

Methods used to capture the role of space in ED users' experiences as adequately as possible, were the data collected at the department itself. Tools such as surveys, interviews, questionnaires, and video and photo capture were used to reach to a conclusion. Tracking their movements revealed the most problematic areas, which inhibited staff performance and the improvement of patients' medical conditions. Questionnaires (Appendix i) and interviews (Appendix ii) showed the users perspective on the matter while observations helped to obtain a better understanding of the department 's physical context. All areas of the unit were taken on consideration. Surveys provided insight into how users used the spaces and how space influenced their behavior.

Environmental factors such as orientation, air conditioning, natural and artificial lighting, room spaces, hall width, and circulation affected their productivity in their everyday work (Appendix ii). The different roles in the ED represent the different areas that are utilized. The parts of the unit where patients are cared for, such as Resuscitation, Observation Room, and Radiology, are used more by doctors. Nurses, it must be noted, play one of the most significant tasks in the ED, not only in terms of constantly caring for patients, but also in terms of maintaining a balance between the medical environment and the outside users. Their mobility has a broader

radius, affecting practically every aspect of the healthcare facility, making them one of the department's key operators. Sanitarians have the same circulation but at a slower rate.

Space insufficiency contributes to the users unsatisfaction. Staff precepted an increase of stress from the lack of space they worked, caused by overcrowding. Almost half of the nurses say the proportions of the ED's work rooms are unsatisfactory. According to their responses, most of them responded more positive in terms of space sufficiency. Nurses believe that the waiting area is insufficient in terms of space. As a result, we have a staff split: half of them think the spaces are satisfactory, while the other half sees room for improvement.

The nurses were significantly more satisfied than the doctors and sanitarian on terms of space. Doctors found difficulties, even though they had the least number of spaces they used most. The information came from their work environments or places they go frequently, such as Observation, Shock Therapy, and so on. There is adequate space in the waiting room for two doctors. Doctors were content with the distances between their working areas.

The sanitarians felt more stressed at work than every other category and had the most negative answers about the lack of space, making us think that a relation does exist. They consider the space as one of the elements that contributed to their stress at work.

The relevance of various spatial components, interaction with personnel, relatives' presence, and waiting time was highlighted in studies on ED patients' experiences from their perspective. ED patients are not only aware of their injured bodies; their knowledge of their bodily perception changes, which, when paired with stress and worry, causes them to relate to components of the surroundings in a different way. It is obvious from the analysis of the findings that patients experience a degree of stress upon hospitalization, and factors that causes it despite their medical condition, have to do with some of the physical environment.

But there are some differences on which components cause this stress on patients. The majority of responses directly related to space were favorable, indicating that the patients were mainly content or did not believe that the space would worsen

their medical condition. However, the same cannot be stated for noises or light, which had a smaller favorable effect. Noises generated by the flux, overcrowding, or the lack of acoustic insulation contributed to the patients' negative view of the ED unit, affecting their contentment with their stay.

74.4 % of the patients interviewed testified that noise had an effect on their comfort. The decrease of deaths after the remodulation shows us that space must have had a positive impact on patients.

Designers and emergency room nurses both have a role to play in making this better. The difficulty is to create a spatial structure that encourages patient–staff connection; room dimensions and door locations influence how stretchers are accommodated and the whole free circulation possibility.

Other contributions the architects can make are creating:

- "Over-flow-space" that can help reduce the amount of randomly placed medical equipment in the hallways.
- Separate waiting patients from ongoing actions when all cubicles or rooms are in use.
- Allowing patients to see what staff is doing reduces their perceptions of being neglected.

According the findings, the challenge for staff and hospital designers is to work together to develop and implement interventions that support staff in emphasizing a human approach while also addressing the medical-technical aspects of emergency care. The target of the designers is creating a ProHealth environment to maximize the staff productivity and the patient satisfaction.

7.2 Limitations

- Wasn’t allowed to video take the patients movement.
- From the interview goal of taking 50, only 34 answered.
- There was no information about the current plans or the history of the department.
- A part of the staff didn’t want to complete the questionnaire.
- At the begging the environment wasn’t that friendly and welcoming postponing the data collection.

7.3 Recommendations for future research

Considering the lack of spaces in the ED there is a need to adapt or add other areas that can handle better the flux. Building the missing parts of the unit might be one of the solutions too. To add more to the treatment area Short Stay unit might be added to accommodate more patients. Further approach might be to take on consideration other departments to in order to have a more complete view on the impact environmental components have.

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Appendix i

Questionnaire

Position:

Age:

Sex:

1. You have been working in this position for how long?
2. Do you feel stress?
3. Do you think space affects your performance?
4. How is your routine track in the department?
5. Which spaces do you use more during the day?
6. Does moving into different areas distract you?

Questions about the physical components:

7. What do u think work better in the Emergency department?

Natural light/ Artificial light/ Wayfinding/ Space/ Flow/ Acoustic

8. What do u think it doesn't work in the Emergency department?

Natural light/ Artificial light/ Wayfinding/ Space/ Flow/ Acoustic

9. How do you value wayfinding in the Emergency?
10. How do you value ventilation in the Emergency?
11. How do you value natural light in the Emergency?
12. How do you value artificial light in the Emergency?
13. How do you value spaces in the Emergency?
14. From your personal experience do you value the waiting area as enough?

15. Do you find difficulties in moving through the hall?
16. The spaces u mostly use are near to each other?
17. Do you find your job tiring?
18. Which from the components you think affect your work?

Light/ Ventilation / Wayfinding/ Space/ Flow/ None

19. How do you deal with flux?
20. Do you have enough space to do your job?
21. What would you like to change in the environment you work? (Open end question)

Appendix ii

Interview questions:

1. Do you feel comfortable in the environment u are placed?
2. Do u think the space around your bed it is enough?
3. Do u have the adequate privacy?
4. Do you think the toilet is far from your bed, and does this give you difficulties on accessing it?
5. Do u need a companion to help you get places?
   a. If yes, do you have enough space moving around?
6. Do you have enough lighting?
7. Do u have enough ventilation?
8. Do the noises bother you?

Appendix iii

Statistics for outpatients that got no treatment,ED of RH,2018

Months	***Total : Entries***	***Total : Exit***	***Healed***	***Improved***	***Transferred to other units***	***Deaths***

Jan	*528*	*528*	*0*	*528*	*0*	*0*
Feb	*314*	*314*	*0*	*314*	*0*	*0*
Mar	*640*	*640*	*0*	*640*	*0*	*0*
Apr	*231*	*231*	*0*	*231*	*0*	*0*
May	*287*	*287*	*0*	*287*	*0*	*0*
Jun	*465*	*465*	*0*	*465*	*0*	*0*
Jul	*562*	*562*	*0*	*562*	*0*	*0*
Aug	*295*	*295*	*0*	*295*	*0*	*0*
Sep	*745*	*745*	*0*	*745*	*0*	*0*
Oct	*332*	*332*	*0*	*332*	*0*	*0*
Nov	*267*	*267*	*0*	*267*	*0*	*0*
Dec	*467*	*467*	*0*	*467*	*0*	*0*
Total :	*5132*					

Statistics for outpatients that got treatment but didn't get registered, ED of RH,2018

Months	***Total : Entries***	***Total : Exit***	***Healed***	***Improved***	***Transferred to other units***	***Deaths***
1. Jan	*2427*	*2427*	*0*	*2427*	*0*	*0*
2. Feb	*2251*	*2251*	*0*	*2251*	*0*	*0*
3. Mar	*2205*	*2205*	*0*	*2205*	*0*	*0*
4. Apr	*2343*	*2343*	*0*	*2343*	*0*	*0*
5. May	*2526*	*2526*	*0*	*2526*	*0*	*0*
6. Jun	*2442*	*2442*	*0*	*2442*	*0*	*0*
7. Jul	*2391*	*2391*	*0*	*2391*	*0*	*0*
8. Aug	*2254*	*2254*	*0*	*2254*	*0*	*0*

9. Sep	*2204*	*2204*	*0*	*2204*	*0*	*0*
10. Oct	*2528*	*2528*	*0*	*2528*	*0*	*0*
11. Nov	*2179*	*2179*	*0*	*2179*	*0*	*0*
12. Dec	*2205*	*2205*	*0*	*2205*	*0*	*0*
Total	*27955*					

Statistics for inpatients that got treatment and registered, ED of RH, 2018

Months	***Total : Entries***	***Total : Exit***	***Healed***	***Improved***	***Transferred to other units***	***Deaths***
1. Jan	*2192*	*2192*	*0*	*1797*	*361*	*10*
2. Feb	*1937*	*1937*	*0*	*1534*	*378*	*12*
3. Mar	*1976*	*1976*	*0*	*1550*	*406*	*7*
4. Apr	*2152*	*2152*	*0*	*1751*	*377*	*7*
5. May	*2618*	*2618*	*0*	*2017*	*570*	*7*
6. Jun	*2706*	*2706*	*0*	*2045*	*630*	*13*
7. Jul	*3683*	*3683*	*0*	*3662*	*0*	*8*
8. Aug	*2627*	*2627*	*0*	*2201*	*406*	*7*
9. Sep	*2321*	*2321*	*0*	*1552*	*744*	*8*
10. Oct	*2348*	*2348*	*0*	*1975*	*358*	*3*
11. Nov	*2449*	*2449*	*0*	*2076*	*360*	*2*
12. Dec	*2277*	*2277*	*0*	*1922*	*343*	*2*
Total	*29286*			*4891*	*84*	

Statistics for outpatients that got no treatment,ED of RH,2019

Months	***Total : Entries***	***Total : Exit***	***Healed***	***Improved***	***Transferred to other units***	***Deaths***
4 first months	*1024*	*1024*	---	---	*0*	*0*
1. May	*287*	*287*	*0*	*287*	*0*	*0*
2. Jun	*355*	*355*	*0*	*465*	*0*	*0*
3. Jul	*471*	*471*	*0*	*562*	*0*	*0*
4. Aug	*320*	*320*	*0*	*295*	*0*	*0*
5. Sep	*654*	*654*	*0*	*745*	*0*	*0*
6. Oct	*415*	*415*	*0*	*332*	*0*	*0*
7. Nov	*322*	*322*	*0*	*267*	*0*	
8. Dec	*389*	*389*	*0*	*467*	*0*	
Total :	*4237*					

Statistics for outpatients that got treatment but didn't get registered, ED of RH,2019

Months	***Total : Entries***	***Total : Exit***	***Healed***	***Improved***	***Transferred to other units***	***Deaths***
First 4 months	*9322*					
1. May	*2212*	*2212*	*0*	*2212*	*0*	*0*
2. Jun	*2386*	*2386*	*0*	*2386*	*0*	*0*

3. Jul	*2432*	*2432*	*0*	*2432*	*0*	*0*
4. Aug	*2195*	*2195*	*0*	*2195*	*0*	*0*
5. Sep	*2526*	*2526*	*0*	*2526*	*0*	*0*
6. Oct	*2078*	*2078*	*0*	*2078*	*0*	*0*
7. Nov	*2130*	*2130*	*0*	*2130*	*0*	*0*
8. Dec	*1827*	*1827*	*0*	*1827*	*0*	*0*
Total	*26608*					

Statistics for inpatients that got treatment and registered,ED of RH,2019

Months	***Total : Entries***	***Total : Exit***	***Healed***	***Improved***	***Transferred to other units***	***Deaths***
First 4 months	*10874*					
1. May	*1641*	*1641*	*0*	*1284*	*0*	*2*
2. Jun	*1860*	*1860*	*0*	*1503*	*0*	*5*
3. Jul	*2143*	*2143*	*0*		*0*	*8*
4. Aug	*3565*	*3565*	*0*	*3147*	*0*	*7*
5. Sep	*1741*	*1741*	*0*	*1419*	*0*	*6*
6. Oct	*2101*	*2101*	*0*	*1788*	*0*	*4*
7. Nov	*2280*	*2280*	*0*	*1972*	*0*	*8*
8. Dec	*1870*	*1870*	*0*	*1520*	*0*	*3*
Total	*29076*					